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THE AUTHORS OF THE SEVERAL PAPERS ARE SEVERALLY RESPONSIBLE FOR THE SOUNDNESS OF THE OPINIONS GIVEN AND FOR THE ACCURACY OF THE STATEMENTS MADE THEREIN

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[PROC. ROY. SOC. VICTORIA, 18 (N.S.), PT. I., 1905].

ART. I.—*On a Palaeozoic Serpentine Conglomerate, North Gippsland.*

BY E. O. THIELE.

(With Plate I.).

[Read 9th March, 1905].

The conglomerate under consideration belongs to a serpentine belt and associated series of basic igneous rocks of undetermined area. It is situated in the parish of Dolodrook, county of Wonnangatta, about 7 or 8 miles in a straight line west from Mt. Wellington. The country is rough and precipitous, so that the very short time available for examining the occurrence did not permit of any attempt being made to trace the boundaries of the serpentine and igneous rocks. This series of rocks, however, apparently forms a belt of no great width, and stretches south-easterly from a point about a mile-and-a-half south-east of the junction of the Wellington River with a stream which it is proposed to name the Dolodrook River. This tributary enters on the left bank of the main stream, but is unfortunately locally known as the Right Branch of the Wellington. Mr. R. A. F. Murray, in his report on the "Geology of South-East Gippsland,"[1] mentions the fact that he was unable to investigate the area immediately to the west of Mt. Wellington, but that it was nearly certain to afford geological features of interest, as he had heard of the occurrence of serpentine from that district, and that the sample of chrome iron ore mentioned in Progress Report, No. III., p. 172, came from the same place. The rocks of the greater part of the Mt. Wellington district consist of coarse red to chocolate coloured conglomerates, sandstones, finer shales and a varied series of igneous rocks forming an extensive Upper Palaeozoic belt, extending north-westerly across the Main Divide to Mansfield.

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[1] Progress Report, No. V., Geol. Surv. Vic., p. 57.

This series has been described as Devonian, but the northern portion is now generally accepted as Carboniferous, chiefly on account of the revision of the fossil fish from the Mansfield district by A. Smith Woodward, LL.D., F.R.S.[1] As, however, our knowledge of the relation of the southern part of this region to the Mansfield series is scanty, it is thought preferable at present to refer to the rocks of the Mt. Wellington series as simply Upper Palaeozoic.

At the junction of the Wellington River with the Dolodrook River, the writer obtained a series of well preserved graptolites from highly inclined black slates. These fossils have been handed over to Mr. T. S. Hall, M.A., who intends to work them shortly. Mr. Hall says that these graptolites represent an undoubted Upper Ordovician age, and, as the associated rocks were traced for some miles along the Wellington River and also observed in numerous sections along the Dolodrook River, an extensive inlier of Ordovician rocks is thus shown to exist in the Upper Palaeozoic area. The older rocks are much folded and in places show faulting accompanied by considerable crushing and crumpling. The Upper Palaeozoic rocks show little disturbance and rest unconformably on the Ordovician series with a general prevailing dip westerly, in this locality, at a low angle.

The observations in the serpentine area were confined principally to an interesting conglomerate noted at the north-west end of the serpentine belt.

The occurrence was reached by following up the Dolodrook River from its junction with the Wellington for less than half-a-mile, and then branching off to the left up a small steep tributary gully, locally known as Black Soil Gully. This small creek owes its name to the fact that there is a considerable accumulation of black soil filling up the upper portion. The soil has evidently been derived mainly from the decomposition of the serpentine rocks, but also contains numerous small flakes of indurated black slate. Along the serpentine occurrence the black to reddish colour of the soil forms a marked contrast to the barren nature of the Ordovician rocks on either side.

Just above the head of Black Soil Gully there is a lower portion of a spur forming what is generally known as the Monument Gap. On both sides of the spur in this vicinity and extending on in a south-easterly direction, the serpentine rocks can be traced. They appear to have been subjected to a considerable amount of mechanical deformation, so that a well defined foliated structure has been induced. The general trend of the planes of foliation is from the north-west to the south-east, and coincides generally with the strike of the Ordovician rocks. Local variations, however, were observed and further on where the chrome iron ore occurs the foliation was more easterly. That the rocks have been subjected to considerable movement, and probably torsion also, is shown by the polishing and slickensiding of the serpentine laminae. Smoothed and rounded boulders were abundant on the slopes of the spur and several were found which showed distinct grooving and striation, and apart from this feature the shape of many of the boulders was even more suggestive of ice action. These boulders were traced to parallel bands in the serpentine, the general features of which are of considerable interest.

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[1] Brit. Assoc. Belfast, Sept., 1902.

The matrix is for the most part serpentine and contains rounded boulders up to six inches and more in length. The included rocks are of various kinds, those noted being, quartzite and other indurated rocks, micaceous schist and basic igneous rock. The boulders of the latter are for the most part either wholly or partially serpentinised. These are the softest rocks in the deposit and are the only ones that showed marked striations. Between the larger boulders, a finer grit is frequently found and the component particles of this portion of the deposit consist chiefly of rounded grains which are now serpentine. Some of the pebbles show distinct evidence of movement in the matrix and consequent slickensliding due to the abrasion by the finer grit. Mechanical deformation is well shown by one of the serpentine boulders which shows a structure similar to that induced by the squeezing of a partially dry ball of putty.

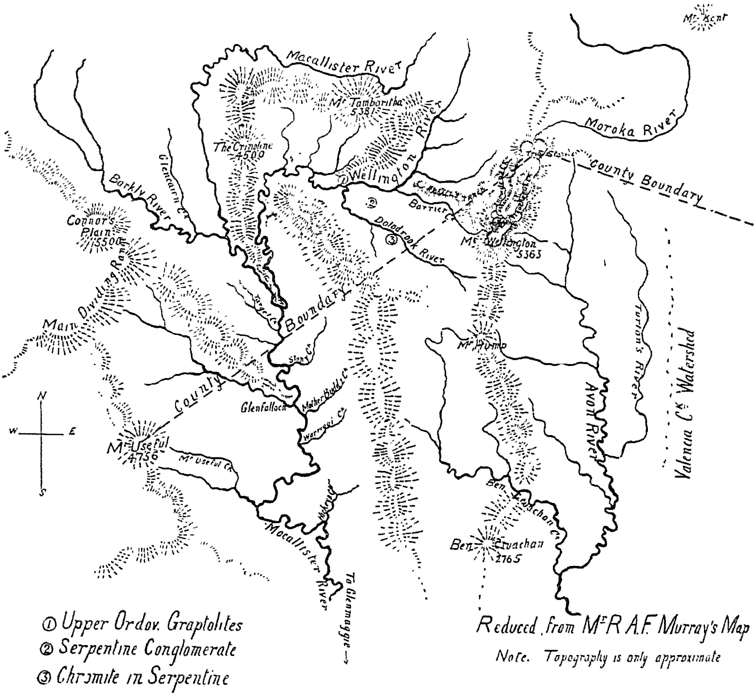
The grooving, and particularly the shape of many of the boulders when examined in the hand specimens, would suggest at once the ice origin of the material, but when the subsequent intense pressure, movement and torsion indicated in the rocks is taken into account the value of striation at any rate becomes less important. It is possible, however, as indicated by the shape of many of the included boulders, that glacial action may be the original agency to which the origin of the conglomerate is to be attributed, but both the mechanical and chemical alterations which have taken place make the question a very difficult one to decide at present. The age of this deposit is at present also somewhat obscure, as no sections showing clearly the relation of the conglomerate to the Ordovician rocks or the Upper Palaeozoic series were observed.

Conglomerates are largely developed in the neighbouring Carboniferous rocks, but these differ markedly in lithological features from those of the serpentine area and, further, they usually show little mechanical disturbance.

The general coincidence of the foliation of the serpentine with the prevailing strike of the Ordovician rocks, which here are much folded and broken, points rather to the probability of the serpentine and associated rocks being Ordovician or older.

The conglomerate described appears to present some features quite distinct from those hitherto observed in other conglomerates of Victoria, and some of these are perhaps quite peculiar to this deposit. Serpentine is not a usual matrix of conglomerates; other instances may be known, but in the numerous descriptions of the serpentine occurrences of Great Britain, the Alps and elsewhere, I have been unable to find reference to a conglomerate of this nature.

These few remarks have been written to draw the attention of other geologists to the peculiarities of this deposit, in the hope that some of them may have an opportunity of examining the occurrence more fully and thus aid in solving some of its mysteries.



SKETCH MAP of Mt WELLINGTON DISTRICT

10 12 14 16 18 20

Scale of Miles

[PROC. ROY. SOC. VICTORIA, 18 (N.S.), PT. I., 1905].

ART. II.—*New or Little-known Victorian Fossils in the National Museum, Melbourne.*

PART V.—ON THE GENUS RECEPTACULITES.

WITH A NOTE ON R. AUSTRALIS FROM QUEENSLAND.

BY FREDERICK CHAPMAN, A.L.S., &c.,

National Museum.

(With Plates II.-IV.).

[Read 13th April, 1905].

INTRODUCTORY REMARKS.

This paper is devoted to (1) the description of a new species of Receptaculites from the Silurian of Victoria; (2)—the recording of some Victorian Middle Devonian, localities for R. australis, Salter; (3)—the description of certain silicified casts of R. australis collected by the late Mr. Richard Daintree, C.M.G., from the Gympie or Star Beds, Mt. Wyatt, Queensland.

The Devonian specimens of R. australis were originally recorded by Salter as from the Silurian of Australia,[1] and this reference is copied by later authors. The mistake is probably due to the fact that at the New South Wales locality, near Yass, both Silurian and Devonian fossils occur in close proximity, and the two series were most likely mixed by the Rev. W. B. Clarke, who sent the specimens to Salter. In the Molong District, New South Wales, however, R. australis occurs, as Mr. W. S. Dun of the Sydney Department of Mines informs me, in association with Halysites.[2] There is little doubt, therefore, that R. australis did make its appearance in Silurian times, but attained its maximum abundance during the Devonian.

R. australis has formed the subject of a paper by R. Etheridge, junr., and W. S. Dun, in which the structure of the specimens from the Middle Devonian of New South Wales is very thoroughly discussed. The examples dealt with by those authors were apparently too fragmentary to afford any precise data for a complete restoration of the external shape of R. australis, for they remark[1] on p. 74:—

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[1] Canadian Organic Remains, Dec. 1, 1859, p. 47.

[2] This is probably the fossil recorded by W. B. Clarke (Sed. Form., N. S. W., ed. 4, 1878, p. 16) under the name of R. neptuni, Defr.

"The evidence as to form is by no means conclusive, but seems to support the view of Billings and Rauff that it was in some degree spherical or top-shaped, as against that of Hinde, who regards Receptaculites as a more or less basin or platter-shaped body."

By means of an extensive series of more or less fragmentary specimens of R. australis from Queensland, described in the sequel, we are fortunately able to arrive at a fairly accurate idea of the external form of this interesting fossil.

The occurrence of R. australis in the Middle Devonian limestones of Buchan and Bindi is of especial interest, as affording further proof of the similarity of the fossil contents of those beds with others in New South Wales. Other fossils from Buchan and Bindi, common to Middle Devonian areas in New South Wales, are the various species of Favosites and Syringopora spelaeanus described by Mr. R. Etheridge, junr. Further investigation of the fossils from the Gippsland localities will in all probability afford additional proof of the contemporaneity of these limestones in the two States.

DESCRIPTION OF THE VICTORIAN SPECIMENS.

Genus *Receptaculites*, Defrance.

Receptaculites fergusoni, sp. nov.

(Pl. I., Figs. 1 and 3; Pl. III., Fig. 1).

Description.—This is based on a cast of the lower or outer wall of the sponge, preserved in yellowish, hardened mudstone. Nearly one-half of the sponge is represented, showing the form is funnel-shaped, with indications of a deep central cavity. The surrounding area is broad, depressed and strongly undulated.

The identity of this fossil with Receptaculites is clear, on account of its depressed conical form; as distinguished from

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[1] Records of the Geological Survey of New South Wales, vol. vi., pt. i., 1898.

Ischadites, which has a sub-spherical or pyriform body, often concave at the base.

A wax squeeze taken from this fossil cast shows the form of the depressed summit plates, with occasional traces of the diagonal, horizontal, spicular structure. There is also a distinct crenulation on the edges of the summit plates, similar to the figure of the Wenlock specimen of R. ? neptuni Defr., figured by Dr. Hinde.[1]

Measurements.—The present specimen measures 20 mm. in its longest diameter, and probably represents about two-thirds of the entire expanse, or a total diameter of about 30 mm. The rhombic summit plates average 1.5 mm. in their greatest width, and they do not show much variation in size.

Observations.—R. fergusoni shows certain affinities with R. neptuni, Defrance,[2] particularly in the shape of its summit plates and their crenulated margins. It is, however, much smaller than that species, and its conical base not so prolonged.

Occurrence.—In the yellowish hardened mudstone of Silurian age; Wombat Creek, a tributary of the Mitta Mitta River, N.E. Gippsland. From the Mines Department; collected by W. H. Ferguson, after whom the fossil is named [2317].

The above fossil is associated with typical Silurian forms belonging to the genera Euomphalus, Orthis and Atrypa.[3]

Receptaculites australis, Salter.

(Pl. I., Figs. 2, 4, 5, 6, 7; Pl. II.; Pl. III., Figs. 2-7).

Receptaculites australis, Salter, 1859, Canad. Organic Remains, Dec. 1, p. 47, pl. x., figs. 8-10. R. Etheridge, junr., and W. S. Dun. 1898, vol. vi., pt. 1, p. 62., pls. viii.-x.

Observations.—In our Victorian specimens it is the median portion of the sponge wall that is generally seen; the weathering of the fossil producing a regularly papillate surface, owing to the exposure of the ends of the vertical rays or pillars.

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[1] Pal. Soc. Mon., vol. xl., 1886 (1887). Brit. Foss. Sponges, pt. i., pl. ii., fig. 3.

[2] Dict. Sci. Nat., vol. xlv., p. 5, Atlas, pl. lxviii., fig. 1a-d. See also G. J. Hinde, loc. supra cit., p. 139, pl. ii., fig. 3, pl. iv., fig. 1.

[3] For the relationship of the fossiliferous beds, see W. H. Ferguson, in Monthly Progress Rep., No. 3, 1899, Geol. Surv. Vict., p. 17.

These weathered terminals frequently present a rough, rosetted appearance, due to the replacement of the original substance of the pillars by crystalline calcite. The centres of the pillars often contain a residual crystal of calcite towards which the outer and adjacent ones converge, which seems to point to the former existence of a central canal. The calcite crystals surrounding the central area in our specimens sometimes exhibit in transverse section under the microscope a radial grouping of brush-like clusters of fine dark lines, possibly indicative of a previous organic structure as was pointed out by von Gümbel.[1]

Beekite, which was recorded by Etheridge and Dun as occurring in the specimens from New South Wales, has not yet been noticed in our Victorian specimens.

A specimen from Buchan, in grey limestone, shows the rarely occurring actual form of the summit plates of the lower or outer surface of the body-wall of the sponge. On the opposite, weathered face of the same specimen the condition of the pillars shows that they were axially perforated by a slender canal.

The microscopical examination of a number of thin slices of Receptaculites in Middle Devonian limestone, both from Victoria and New South Wales, has revealed isolated and fragmentary horizontal spicules apparently detached from the external layers of the sponge, and distributed through the infilling material or mud forming the black limestone (Plate IV., Figs. 2, 3). These spicules resemble the rest of the sponge-remains in the same beds in being now in the form of calcite. Hinde has remarked[2] with regard to the examples of Receptaculites found in the Trenton Limestone, that, whilst the axial canals are distinctly shown in the siliceous portions of specimens, those parts replaced by calcite have the canals entirely obliterated. One of our specimens, however, which has been replaced by crystalline calcite, shows unmistakable traces of the central canal (Plate IV., Fig. 2). As regards the identity of the spicular body shown on Plate IV., Fig. 3, it may be noted that the space between the two circular prominences exactly corresponds with the distance between the extremities of the vertical pillars of the Devonian examples.

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[1] Abhandl. k. bayer. Akad. Wiss, 1875, Bd. xii., Abth. i., p. 192.

[2] Quart. Journ. Geol. Soc., vol. xl., 1884, p. 810.

Occurrence.—The Victorian specimens of R. australis came from two localities, Buchan and Bindi, both from the Middle Devonian. The examples from Buchan occur alike in the grey, rather crystalline limestone, and in the black limestone. The specimen in black limestone from Buchan was presented to the Muesum by Mr. G. Sweet, F.G.S. That from the grey limestones was collected by James Stirling, F.G.S., and received from the Mines Department, Melbourne.

The Bindi specimen (Mines Dept., 4113) is in a bluish-grey limestone, weathering brown, and apparently containing a fairly large amount of bituminous matter (anthraconite or stinkstein). This specimen is not mentioned in the general report on the collection by Prof. McCoy (See Progress Report, No. 4, 1877, p. 158).

NOTE ON SOME QUEENSLAND SPECIMENS OF R. AUSTRALIS.

In their "Geology and Palaeontology of Queensland," Messrs. R. Etheridge, junr., and R. L. Jack refer to specimens of a Receptaculites collected by R. Daintree from Mt. Wyatt, but which were afterwards lost sight of. In a note in the above-mentioned work, Dr. R. L. Jack writes as follows: [1]"The late Mr. Daintree observed, at Mount Wyatt diggings, certain slates and shales containing Chonetes sarcinulata, an Orthis allied to O. rustica, Receptaculites and Leptaena, as determined by Sir F. McCoy. These rocks were unconformably overlaid by beds, probably of the "Star" series, containing Lepidodendron. On the strength of the fossils, the strata first alluded to were assumed to be of Upper Silurian age. The assumption was based on a single, distinctly specifically determined Brachiopod, Chonetes sarcinulata, now known to range upward into Devonian times, an Orthis, which might be allied to an Upper Silurian species, without being itself of that age—the genus ranging all through the Silurian, Devonian and Carboniferous—a Receptaculites [every effort has been made, both in London and Brisbane, to trace this fossil, but without success—footnote by R.E., Jun.] and a Leptaena (Silurian and Devonian) not specifically determined. I have not been able to identify the locality referred to by Mr. Daintree, but, as I observed both the Star Beds and the Gympie Beds in the neighbourhood, I think it probable that the Chonetes, etc., beds belong to the latter."

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[1] Geol. and Pal. of Queensland and New Guinea, London, 1892, p. 95.

The specimens to which the above reference is made I have lately found amongst the collections of fossils at the National Museum. They were sent by Mr. Daintree to Prof. McCoy on the 7th of September, 1866 (date on box label). The specimens consist of negative replacements of the sponge, in chalcedonic silica, and they agree in their general characters with the better known examples of R. australis from New South Wales. Whether these sponge-bearing beds of Mt. Wyatt belong to the Gympie or to the Star Beds, they, at all events, show an extension of the geological range of this species into beds of Carboniferous age.[1]

Much has already been written on the structure of this sponge, but I venture to add these notes on the Queensland fossils on account of the excellent condition of the casts of the inner and outer layers of the organism. Photographs of the more important examples are included in this paper in order that a comparison of its external features can be made with the excellent figures of the New South Wales Receptaculites given by Etheridge and Dun.

Condition of the Fossils.—The matrix of the bed yielding the Receptaculites is a chalcedonic chert strongly permeated with peroxide of iron. In every case the structure shown by the fossil is a negative one; the outer spicular layer and the rhombic summit plates, however, are so faithfully preserved that a wax squeeze gives a very detailed impression of the original structure.

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[1] A few impressions of other fossils occur in the matrix with the Receptaculites. These are referable to Leptaena analoga, Phillips, sp., and the species of Fenestella figured by de Koninck under the name of F. multiporata, McCoy (Descr. Pal. Foss. N.S.Wales, Transl. 1898, p. 134, pl. viii., f. 1, 1a [non 4]). The latter differ from McCoy's Irish specimens, as Mr. Etheridge, Jun., has already pointed out, in the small size and the delicate habit of the zoarium. It is also more divergent in its method of branching. In view of these differential characters, I would propose the specific name Konincki for the Australian specimens. The above-named fossils add no further data for settling the precise horizon of these sponge-bearing beds, as they are found alike in the Star and Gympie series.

When the fossils are sliced vertically, that is, through the outer and inner layers of the wall, and examined microscopically, it is seen that the internal portion with the vertical series of pillars has been absorbed or dissolved during silicification, and, the intervening space being almost entirely filled up by silica, only the bases of the vertical pillars are just discernible in certain places on the cut surface. The internal structure is chiefly visible here and there merely as a ferruginous streak, with patches of partially destroyed spicular structure. In one specimen the form of the spicular mesh has been preserved in iron oxide, which has evidently been the replacing material of the original sponge-structure.

In the case of the Queensland specimens, a siliceous mould has been formed over a pseudomorph, in peroxide of iron, of the spicular layers; whilst in the New South Wales examples the siliceous (beekite) replacement is a positive one, formed on a calcitic base, which latter may have been a replacement of an original siliceous structure.

Form and Dimensions of the Sponge.—R. australis seems to have been typically platter-shaped, widely expanded, with a somewhat thick, slightly upturned rim. The central area was hollowed into a short funnel-shaped cavity, and the base, exteriorly, was slightly prolonged and obtusely rounded. There appears to be no evidence amongst our specimens for the shape suggested by Etheridge and Dun, that is, spherical or top-shaped; the peculiar appearance of the specimen which those authors figure,[1] in which the two walls closely approximate, may possibly be due to distortion or pressure prior to fossilisation.

By the aid of a few more than usually complete examples the general external aspect of this species of Receptaculites may be fairly accurately restored (Plate IV., Fig. 7), and its general dimensions ascertained. A more or less flat expanse of about one-half the disc in one particular specimen gives a breadth of 8 cm., and from this and other similarly derived data we may conclude that the sponge often exceeded 15 cm.

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[1] Loc. supra cit., pl. viii., fig. 4.

in diameter.[1] In its vertical height, from the base of the stalk to the level of the rim, this sponge probably measured above 5 cm.

Structure of the Median Layer.—What little remains of the vertical pillars resembles the same structure seen in the organism preserved in the limestone matrix, and is shown by the impressions of the extremities of the pillars taken off the fossils by wax squeezes. The pillars are hollow and constricted near the junction with the outer spicular layers.

Structure of the Upper and Lower Layers of the Body Wall.—The superficial aspect of the Queensland specimens varies according to the particular part of the external layer exposed. Both the summit plates and the underlying spicules in contact with them are clearly seen, and there seems evidence of more than one spicule layer underlying the rhombic plates of the inner or upper surface. So far as can be seen in these specimens, the vertical pillars, constricted near their summits on the inner side of the body wall (endorhin), suddenly expand and give rise to a four-rayed spicular body similar to that shown in the structural diagram of Receptaculites by Billings[2] (Plate IV., Fig. 5).

As previously stated, there is often an intermediate spicule layer between the expanded ends of the pillars and the outer layer of summit plates with their spicular mesh. In this intermediate layer there is a parallel series of fusiform spicules, one end of each spicule being capitate and giving rise to a slender axis turning off at an angle between 90 deg. and 100 deg., and which immediately passes beneath the fusiform spicule-layer. Some approach to this kind of structure is seen in the spicular mesh of Sphaerospongia, an allied genus with hexagonal summit plates, from the Devonian of Devonshire, Germany and Russia.[3]

The external layer is less often seen in our specimens, but when recognisable it shows the sub-rectangular character of the summit plates of the "ectorhin."

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[1] The largest specimens figured by Etheridge and Dun from New South Wales also confirm this measurement.

[2] Geol. Surv. Canada, Palaeozoic Fossils, vol. i., 1865, p. 382.

[3] See Hinde, Pal. Soc. Mon., vol. xl., 1886 (1887). Brit. Foss. Sponges, pt. i., pl. iv., fig. 2c.

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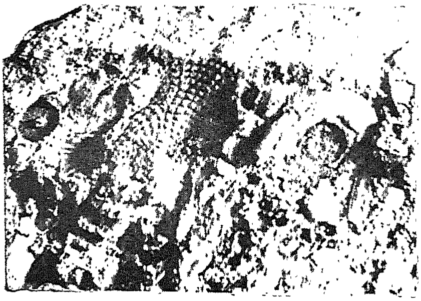

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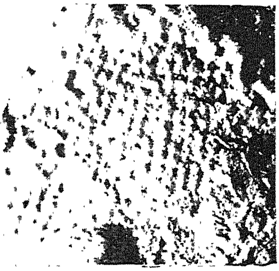

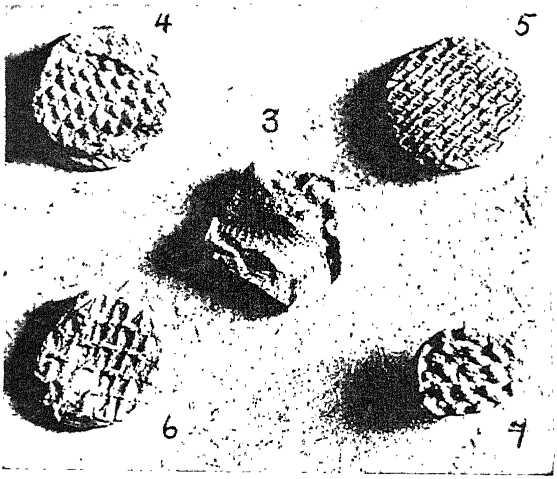

F.C. Photomicr.

Australian Receptaculites.

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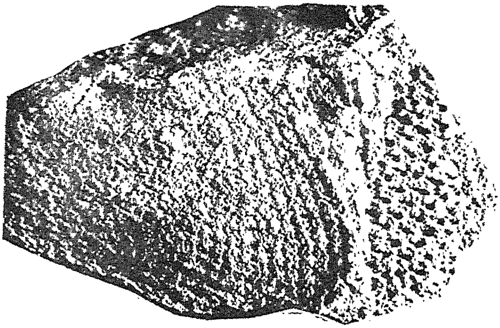

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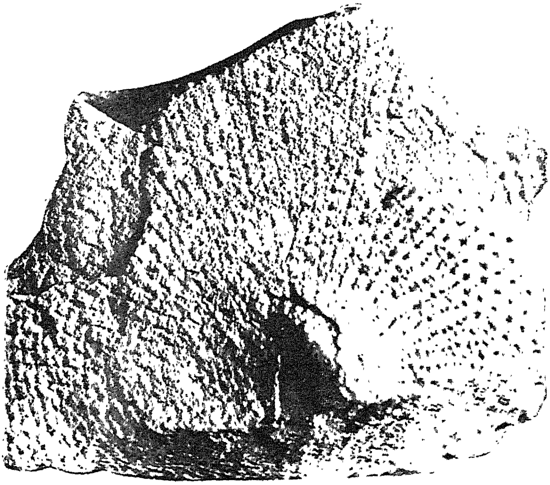
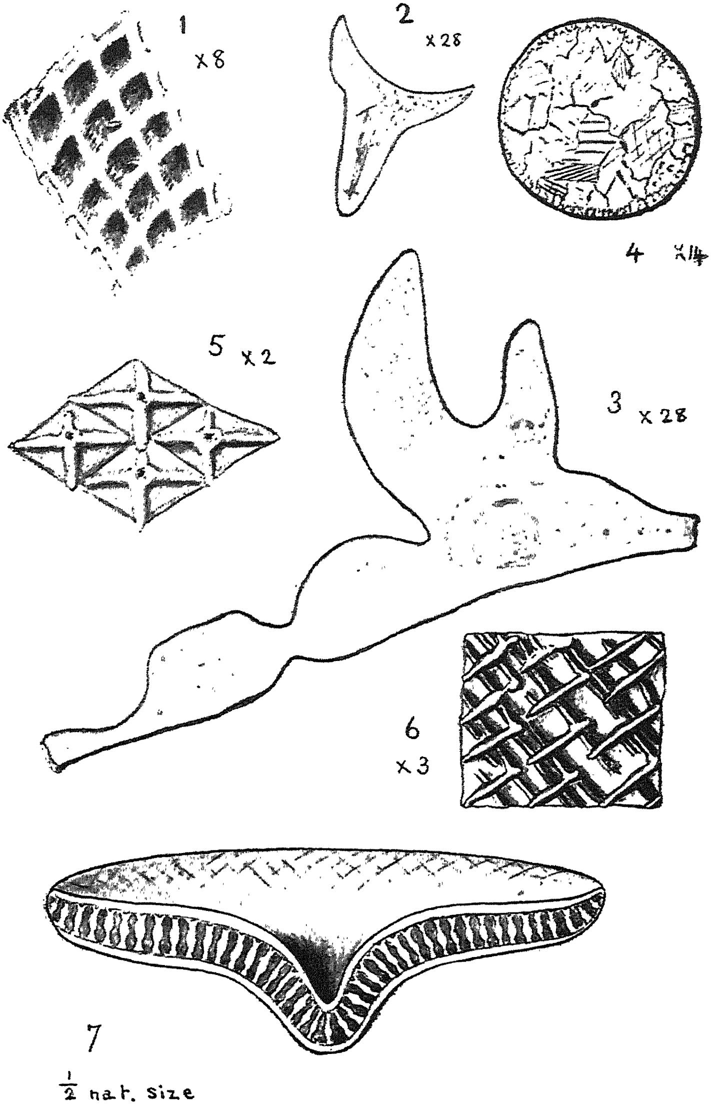


F.C. Photomicr.

Receptaculites—Queensland.



F.C. Del.

Structure of Australian Receptaculites.

SUMMARY.

1. As a genus, Receptaculites ranges from the Silurian to the Carboniferous in Australia. The species R. australis is probably coeval with the genus.

2. The evidence here brought forward with regard to R. australis shows—

(a) The form of the sponge to be sub-discoidal or platter-shaped, with a central funnel-shaped cavity.

(b) The horizontal spicule-rays are apparently derived from, or fused to, the extremities of the vertical rays, at least in the 'endorhin,' and partially so in the 'ectorhin.'

(c) The structure of the horizontal spicular layer shows certain morphological resemblances to that of Sphaerospongia.

(d) The original structure of the Receptaculites from the Mount Wyatt beds, in common with those from Belgium, Silesia and Canada (Hinde) has been pseudomorphosed by peroxide of iron, nearly all of which replacement, in the case of the Australian specimens, has since disappeared, the fossil being represented by a negative cast in silica.

(e) The evidence afforded by the pseudomorphosis of the sponge by peroxide of iron, and its present siliceous epimorphic condition, seems to lend strong support to the idea of an original siliceous structure.

EXPLANATION OF PLATES II.-IV.

PLATE II.

Fig. 1.—Receptaculites fergusoni, sp. nov. Cast of the lower or outer surface of the sponge. Silurian; Wombat Creek, Victoria. [2317]. About natural size.

,, 2.—Lower or outer surface of R. australis, Salter; showing the sub-rectangular form of the summit plates. Middle Devonian; Buchan, Gippsland. [7509]. About natural size.

,, 3.—A wax impression of cast of R. fergusoni, sp. nov.; showing the depressed rhombic summit plates and the twisted funnel-like form of the sponge. About natural size.

Fig. 4-7.—Wax impressions from the negative siliceous casts of R. australis from Mt. Wyatt, Queensland. Figs. 4 and 7 show the relation of the heads of the vertical pillars to the first layer of horizontal spicules. Figs. 5 and 6 are impressions taken from the horizontal spicular layers. About natural size.

PLATE III.

Fig. 1.—R. australis, Mt. Wyatt, Queensland. A specimen showing negatively the rhombic plates of the inner surface of the cup, and the underlying layer with the heads of the vertical pillars. [7504]. About natural size.

„ 2.—R. australis, Mt. Wyatt. External surface of cup, showing central pedicle and characteristic radial and concentric lines. [7505]. About natural size.

PLATE IV.

Fig. 1.—R. fergusoni, sp. nov. Impression of mud-cast in wax, showing the depressed, rhombic summit plates with crenulated margins; also traces of horizontal spicules. [2317]. x 8.

„ R. australis, Salter. Middle Devonian; Cavan, New South Wales. A bifurcate spicule with trace of axial canal; in calcite. [7516]. x 28.

„ 3.—R. australis. Cavan, New South Wales. Part of a fused spicular layer; in calcite. Found commingled with other fragments of spicular mesh in the matrix, close to the series of vertical pillars. [7516]. x 28.

„ 4.—R australis. Middle Devonian; Bindi, Gippsland, Victoria. A transverse section of a vertical pillar, showing a fine inner circumferential layer of scalenohedra of calcite, succeeded by irregular rhomb-faced crystals of the same mineral. The dark line may indicate the former existence of an organic membrane. [7515]. x 14.

Fig. 5.—R. australis, Mt. Wyatt. A wax impression from a hollow cast, showing rhombic plates and attached spicules. [7506]. x 2.

„ 6.—R. australis, Mt. Wyatt. A wax impression from a hollow cast, showing the intermediate spicular mesh of the internal surface, with the parallel series of spicules and their slender axial branches. [7506]. x 3.

„ 7.—A restoration of one-half of the cup of Receptaculites australis, Salter, based on the Queensland specimens. The sectional view does not show the spicular layers immediately in contact with the vertical pillars. About one-half natural size.

[Proc. Roy. Soc. Victoria, 18 (N.S.), Pt. I., 1905].

Art. III.—*New or Little-known Victorian Fossils in the National Museum, Melbourne.*

Part VI.—Notes on Devonian Spirifers.

By FREDERICK CHAPMAN, A.L.S., &c.,

National Museum.

(With Plate V.).

[Read 8th June, 1905].

A Note on the Identity of Spirifer laevicosta, McCoy (*non* Valenciennes), with S. yassensis, de Koninck.

The earliest record of Spirifer laevicosta as a Victorian fossil was given by Selwyn in 1866.[1] In the following year Prof. McCoy wrote[2] regarding the limestone fossils of Buchan, Gippsland, that there was an "abundance of the Spirifera laevicostata, perfectly identical with specimens from the European Devonian Limestone of the Eifel."

The occurrence of this spirifer was subsequently mentioned in two Progress Reports and an Exhibition Essay by McCoy, and it was finally figured and described in the Prodromus of the Palaeontology of Victoria.[3]

In view of the special detailed work on the classification of the brachiopoda published since 1876, giving a better idea of the limitation of specific forms, the publication of these notes may now be opportune.

The Australian species, which has until now been referred to as S. laevicosta (or laevicostata), shows marked specific differences from the S. laevicosta of Europe (Devonshire and the Eifel). It is, however, somewhat allied to the latter species as a Middle Devonian type of spirifer, but is not a typical ostiolate form (with non-plicate median fold and sinus), since the median fold, in the larger and fully-developed specimens, carries a longitudinal groove.

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[1] Phys. Geogr. and Geol. Vict., p. 10 [Exhibition Essays]; (the specific name was misprinted "*loœvicostata*").

[2] Ann. Mag. Nat. Hist., ser. 3, vol. xx., 1867, p. 198.

[3] Decade iv., 1876, p. 16, pl. xxxv., figs. 2-2b.

Points of difference between the European S. laevicosta, Val. and the Victorian S. yassensis, de Kon[1]:—

The specimen which McCoy selected for figuring in the Decades is unusually large,[2] and at a first glance, one acquainted with the European species might see a general resemblance between the two forms.

The Victorian spirifer, however, is sub-ovate in outline, as in the New South Wales specimens, rather than sub-quadrate, as in the European form. The shell is less turgid, the compression also affecting the median fold, which is not so inflated as that of S. laevicosta; there is also a longitudinal groove usually present, especially in the larger Victorian specimens, which is not seen in S. laevicosta. This larger character reminds one of a similar feature in the Devonian S. bifidus, Roemer[3] and the Silurian S. bijugosus, McCoy.[4], The median sinus is narrower and deeper in the central area, and not so acutely V-shaped on the posterior margin of the shell. The shoulders on either side of the beak are steeper and more concave.

The plications are of the same average number in both cases, and show a variation between 11 and 14 counted on either side of the median fold.

The width of the Victorian S. yassensis ranges from 13 to 50 mm.

Spirifer yassensis was first named in MS. by the Rev. W. B. Clarke;[5] and it was afterwards described under the same name by de Konick[6] from specimens obtained from the Devonian limestones of Yass. As I have previously remarked, the New

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[1] In this I have had the advantage of comparing a long series of the European S. lævicosta from the Eifel, in the Nat. Mus. Collection.

[2] Mr. A. J. Shearsby, of Yass, informs me that he has met with equally large specimen, in the Devonian of Yass, although the fossil is commonly like that figured by de Konick, as regards size. There is also a larger specimen than that figured by McCoy in the collection of the National Museum, from Buchan, presented by C. W. Nicholson (See pl. v., fig. 2, of this paper).

[3] Versteinerungen des Harzgebirges, 1843, p. 13, pl. iv., fig. 16.

[4] Synopsis Sil. Foss. Ireland, 1846, p. 36, pl. iii. fig. 23.

[5] Sedimentary Formations of New South Wales, 1875, 3rd. ed., p. 15.

[6] Foss. Pal. Nouv-Galles du Sud, 1876, p. 104, pl. iii., fig. 6.

South Wales specimens, as a rule, are smaller, than those from Victoria; but some of the Buchan specimens are quite as small, being veritable micromorphs, and agreeing in all their characters with the Yass specimens.

Victorian Localities for S. yassensis.—Bindi, head of the Tambo River; Buchan, Murrindal River; and Tabberabbera, at the junction of the Mitchell and Wentworth Rivers.

DESCRIPTION OF SPIRIFER HOWITTI, SP. NOV. (Pl. V., Figs. 4-6).

Shell moderately well-inflated, compressed at the cardinal extremities; sub-quadrate to sub-elliptical, the hinge-line varying in proportion according to length of shell. The chief distinctive characters are the strong plications, 6 to 8 on either side of the median fold; median fold with 2 strong plications, the sinus with two weaker ones, sometimes nearly obsolete; area large; ventral beak much elevated, pointed and only slightly incurved; delthyrium large; dental lamellae well-developed; unweathered specimens show conspicuous, concentric lamellae on the shell surface.

Measurements of three specimens expressed in millimetres:—

	A.	B.	C.
Length of ventral valve	21.5	- 24.5	circâ 19
Width of shell -	28	circâ 28	circâ 29
Greatest thickness -	15.5	- 23.5	- 15.5
Height of cardinal area	4	- 6.5	- 7

This species falls into the section of the Lamellosi, having a lamellated shell-surface. It apparently belongs to the S. mucronatus type of shell, so far as external characters go, described by Conrad from the Hamilton Group (Middle Devonian) of New York.

S. howitti somewhat resembles in outline S. pittmani, lately described by Mr. W. S. Dun from the Devonian of County Cunningham, New South Wales.[1] That species, however, is one of the ostiolate spirifers, and, further, is more numerously plicated.

Locality.—From the Middle Devonian limestone of Bindi, Gippsland, Victoria. Presented by Dr. A. W. Howitt, by whose

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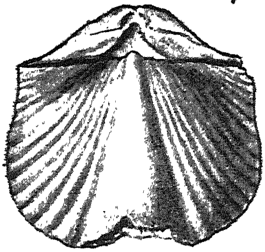
[1] Records Geol. Surv. N.S.W., vol. vii., pt. IV., 1904, p. 320, pl. lxi., figs. 4, 4a, b.

1



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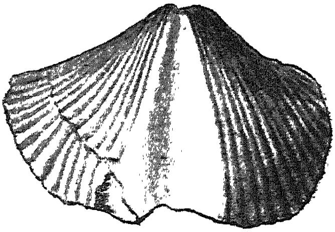

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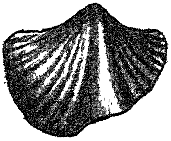

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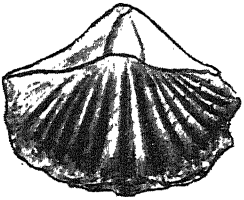

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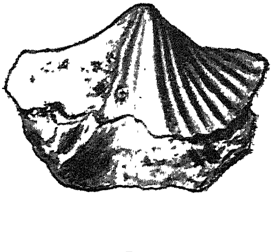

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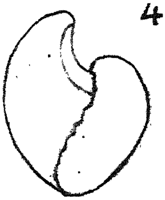

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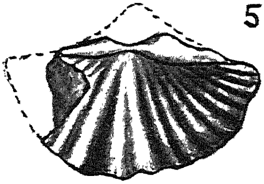

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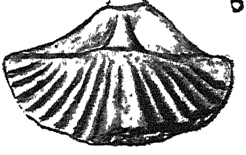

F.C. Del.

Devonian Spirifers from Victoria, etc.

efforts the palaeozoic fossil collection of the National Museum has been considerably enriched, and in whose honour the species is named [1232-4]. Also from the Mines Department of Victoria (coll. by W. H. Ferguson). [7596-7.]

A CHANGE IN NOMENCLATURE.

In Part II. of New or Little-known Victorian Fossils (this journal, vol. xvi., n.s. pt. 1, 1903, p. 65) the name latior was proposed for a species of Lingula. This name was previously given by McCoy to a Carboniferous species (Brit. Pal. Foss., 1855, p. 475, pl. iii., fig. 33), and therefore the above pre-occupied name must lapse. The new name proposed for this fossil is L. yarraensis.

EXPLANATION OF PLATE V.

Fig. 1.—Spirifer laevicosta, Valenciennes. Middle Devonian, Eifel District. From a specimen in the National Museum.

„ 2.—S. yassensis, de Konick. A pedicle valve of a large specimen. Buchan. Pres. by C. W. Nicholson.

„ 3.—S. yassensis, de Kon. A pedicle valve of a small shell. Bindi. From Mines Dept. (Coll. W. H. Ferguson.)

„ 4.—S. howitti, sp. nov. Mid. Devonian, Bindi. Pres. A. W. Howitt. 4a, type specimen, showing high cardinal area, delthyrium, and lamellose surface of brachial valve; 4b, view of pedicle valve, showing the plicate sinus; 4c, profile aspect.

„ 5.—S. howitti, sp. nov. Brachial valve of another specimen, Bindi. From Mines Dept. (Coll. W. H. Ferguson.)

„ 6.—S. howitti, sp. nov. Brachial aspect of another specimen (short form), showing traces of the deltidium. Bindi. From Mines Dept. (Coll. W. H. Ferguson.)

[Proc. Roy. Soc. Victoria, 18 (N.S.), Pt. I., 1905].

IV.—*Victorian Graptolites—Part III.—From near Mount Wellington.*

By T. S. HALL, M.A.,

University of Melbourne.

(With Plate VI.).

[Read 13th July, 1905].

The small collection of graptolites here dealt with was found by Mr. E. O. Thiele at the junction of the right and left branches of the Wellington River, about six miles west of Mount Wellington. The locality was described briefly by him in a paper on Lake Karng, recently read before the Field Naturalists' Club of Victoria,[1] and also in a paper in the present volume.[2] The country to the south-west and west of Mount Wellington is coloured Silurian [Upper Silurian] on the last issued map of the State, but the fossils here dealt with are of Upper Ordovician age. Graptolites of about the same horizon have been known for some years to occur at Mount Matlock, 35 miles to the north-west, and others have recently been found at the Thomson-Jordan junction, 20 miles west. The area, then, of Ordovician is apparently considerable, though it is all mapped as Silurian. The presence of Monograptus, however, in other beds near the Thomson-Jordan junction show that Silurian [Upper Silurian] rocks are present, so that McCoy's reference of certain beds at Mount Matlock to Silurian [Upper Silurian] on what appeared slender evidence may be quite correct.[3] Mr. Thiele's papers, above referred to, show that the Ordovician transgresses further east into the Upper Devonian (? Carboniferous) area shown on the map. There is evidently room for a good deal of careful mapping in this rugged and almost inaccessible district, and results of interest may be expected, especially as the presence of Heathcotian is asserted.

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[1] Victorian Naturalist 22, 1905, pp. 22-31.

[2] A Palaeozoic Serpentine Conglomerate. Proc. Roy. Soc. Vic., 18, n.s. 1905, p. 1.

[3] *See* Whitelaw, O.A.L. The Wood's Point Goldfield. Mem. Geol. Surv. Victoria, No. 3, 1905.

The recent publication by the Palaeontological Society of the fourth part of Miss Elles' and Miss Wood's Monograph of British Graptolites, which deals with the Dicranograptidae, renders it possible at last for useful comparisons of our Australian species to be made with those of Europe. The small size and complicated form of the thecae of this group, together with their frequent imperfect condition of preservation, owing to their delicate structure, and their habit of being embedded at all angles in the bedding plane, make their elucidation one of considerable difficulty. The older descriptions and figures were inadequate, but the revision of the authors mentioned makes easy much that was formerly unintelligible.

The specimens which Mr. Thiele has been kind enough to allow me to examine I have identified as follows:—

Diplograptus thielei, n. sp.
Climacograptus wellingtonensis, n. sp.
Cl. bicornis, J. Hall.
Cryptograptus tricornis, Carruthers.
Lasiograptus, sp.
Dicellograptus elegans, Carruthers.
Dicranograptus nicholsoni, Hopkinson.
Dicr. hians, n. sp.

These are clearly of Upper Ordovician age. The descriptions of the previously-named species have been drawn up from specimens in the present collection, no character being dealt with which cannot be seen in them.

Diplograptus thielei, n. sp. (Pl. VI., Fig. 1).

Hydrosome rather broad, the edges gradually diverging from the sicular end. At about 8 or 10 mm. from the sicula, they become parallel, and so continue to the truncate extremity. Sicula nearly one mm. broad at its aperture and one and a half mm. long. Thecae about $4\frac{1}{2}$ times as long as broad, overlapping $\frac{2}{3}$ their length. Outer wall of the earlier thecae gently sigmoidally curved. In the later ones it is straight. The earlier thecae have spines about 0.5 mm. long; these decrease in size, and ultimately vanish towards the anti-sicular end.

Length of hydrosome, 15 mm.; breadth, 3 mm.; thecae, 13 in 1 cm., inclined at 40 deg.; apertural margin normal to length of thecae. Virgula distinct, free for 1.5 mm. Virgella lax, 1 or 2 mm. long. Apertural spines of earliest thecae 0.5 mm. An additional spine on the sicular aperture.

This species has a close resemblance to D. carnei, mihi, from New South Wales, but the hydrosome of the latter increases in width continuously. The presence of a free virgula in D. thielei is an additional feature of diagnostic value.

Climacograptus wellingtonensis, n. sp.

(Pl. VI., Figs. 2, 3).

Hydrosome regularly tapering to an acute point. Length, 8-10 mm.; breadth, 0.8 to 1.0 mm. Large specimens may reach a length of 45 mm. and a width of 2 mm., not increasing in width for the last couple of centimeters. Virgula distinct, free for about 1 mm. In young specimens the free virgula may be longer. Virgella as long as the hydrosome. Thecae, 13 in. 10 mm.

The relative lengths of the free virgula and virgella are held to be of prime importance in distinguishing the species of this group, and the species so distinguished are stated by Lapworth to have different ranges in time. There are at the same time slight differences in the form of the hydrosomes. The present species approaches the silurian species C. rectangularis McCoy, more closely than any other.

Climacograptus bicornis, J. Hall.

A single well-preserved example of this species is present, and is of normal form.

Cryptograptus tricornis, Carruthers. (Pl. VI., Fig. 4).

Hydrosome of great tenuity, parallel sided, reaching a length of about 15 mm. and from 1 to 1.5 mm. in breadth. The thecae cannot be distinctly made out nor counted in any of the specimens, but their apertures are distinctly shown by a double series of circular marks, one on each side of the virgula, which is fairly distinct. The virgula is free for about 6 mm. The three spines from which the species takes its name are well marked; in fact, they and the virgula are all that remain of many specimens. Carruthers pointed out the great variation in length in the Scotch examples, and the same curious mixture of different growth stages is found with us. None of the specimens before me show much detail. They are almost too nebulous to draw, and Lapworth says that it was only after the accumulation of much material that he was able to determine the characters which induced him to found the subgenus.[1]

Lasiograptus, sp.

A small fragment 2.5 mm. long apparently belongs to this genus. Four or five thecae are present on each side. The lateral appendages are long and slender, and are connected by a single thread along their distal ends. It occurs on the same slab as about 30 examples of Cryptograptus tricornis and a couple of Climacograptus wellingtonensis.

Dicellograptus elegans, Carruthers. (Pl. VI., Fig. 5).

Branches about 6 mm. long; at first almost parallel, then bending outwards and finally inwards, the shape of the polypary resembling a pair of engineer's callipers. Sicula short and broad, there being no evidence of a virgula or virgella in the only two examples before me. Lateral spines short, but distinct. Thecae apparently about 15 in. 1 cm., but not well enough preserved for accurate counting; their outer walls curved; the apertures turned laterally in deep excavations.

Miss Elles and Miss Wood[2] say that the virgella is always well developed. Its apparent absence in the specimen figured may well be due to imperfect preservation. The thecae in the British specimens are said to number from 8 to 10 in. 1 cm. My estimate of 15 is very doubtful, as only two or three can be seen. The extreme broadening of the distal ends of the branches shown in my figure is due to the blurring produced by weathering in the originals.

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[1] *See* Lapworth, Ann. Mag. Nat. H. ser. 5, vol. v., 1880, p. 171. The name of the subgenus is misprinted "Cyrtograptus."

[2] Loc. cit., p. 159.

Dicranograptus nicholsoni, Hopkinson.
(Pl. VI., Fig. 7).

Biserial part 6 mm. long, with 6 or 7 thecae on each side; increasing in breadth from 0.7 mm. at the proximal end to 1.5 mm. at the point of bifurcation. Uniserial branches straight; 7 cm. long (broken); width 1 mm.; axillary angle, 40 deg. Thecae 10 in. 1 cm., strongly curved, with laterally facing apertures opening into deep excavations which indent the branch for about a third of its width. Spines on the first two or three thecae of the uniserial portion.

The only difference noticeable from the species as described by Miss Elles and Miss Wood is that in the British examples the uniserial portion is of even width throughout, while in ours there is an increase. This is probably not of sufficient importance for a specific difference, and moreover I have but a single specimen.

Dicranograptus hians, n. sp. (Pl. VI., Fig. 6).

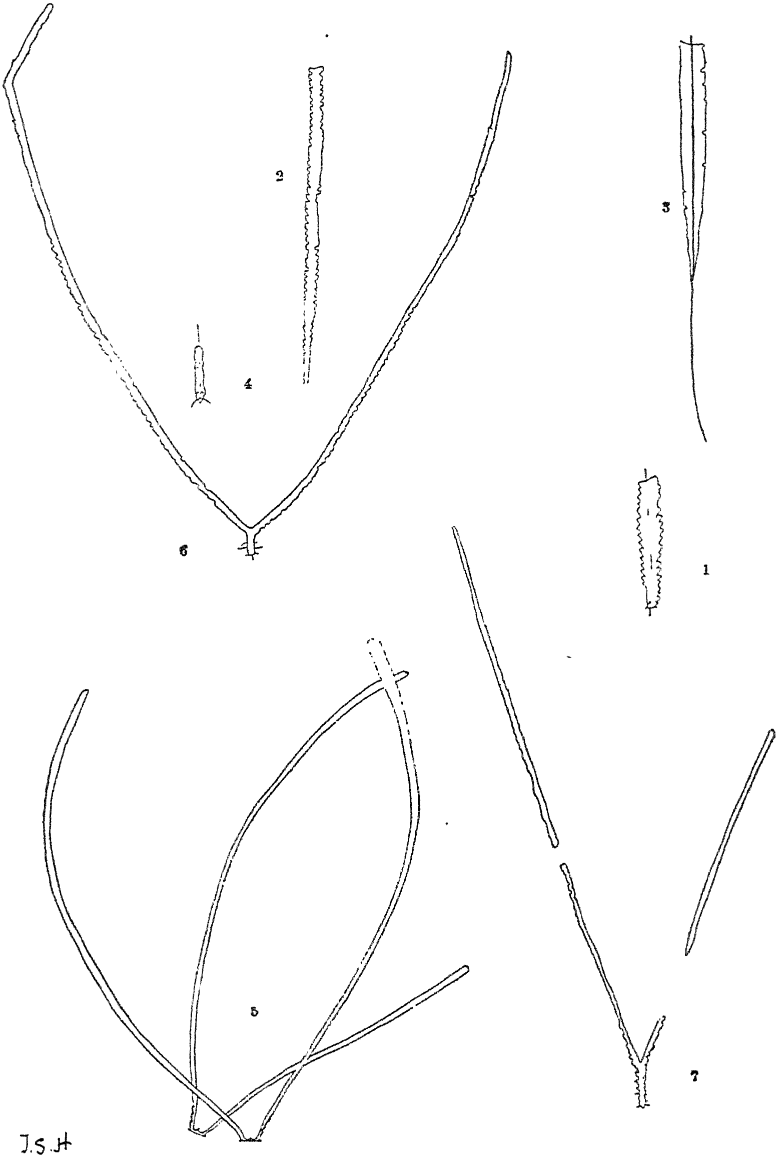
Biserial portion about 3 mm. in length and 1 mm. broad, with about three thecae on each side. Axillary angle, 90 deg., the uniserial branches slightly curving towards one another, their length being about 6 cm. and breadth 1 mm. Thecae with slightly curved ventral margins and horizontal apertures; 12 in. 1 cm. The thecae of the uniserial portion are spined, and there is a distinct virgella.

The species belongs to group 2 of Miss Elles' and Miss Wood's subdivision of the genus, but is quite unlike either of the contained species. The wide angle of divergence of the branches suggests the specific name.

DESCRIPTION OF PLATE VI.

1.—Diplograptus thielei, n. sp. x 1.
2.—Climacograptus wellingtonensis, n. sp. (?); a larger specimen than usual. x 1.
3.—Climacograptus wellingtonensis, n. sp. x 1⅓.
4.—Cryptograptus tricornis, Carruthers. x 1.
5.—Dicellograptus elegans, Carruthers. x 1.
6.—Dicranograptus hians, n. sp. x 1.
7.—Dicranograptus nicholsoni, Hopkinson. x 1.

Proc. R.S. Victoria, 1905. *Plate VI.*



J.S.H.

[Proc. Roy. Soc. Victoria, 18 (N.S.), Pt. I., 1905].

Art. V.—*The Mineralogical Characters of Victorian Auriferous Occurrences.*

By T. S. HART, M.A., F.G.S.

Lecturer on Geology and Mining, School of Mines, Ballarat.

[Read 13th July, 1905].

The contributions of various authors to the Mineralogy of Victoria have included records of a large number of minerals from the quartz reefs and other auriferous matrices (see especially references 1 to 4 below). In some cases the associations in which the minerals occur are described, and their bearing on the gold-contents noticed. It was early seen that certain minerals were present on nearly all the Victorian goldfields. This prevalence of the one mineralogical type, even in cases where structural features were widely different, has perhaps been one cause of the scantiness of the attention given to the mineralogical characters of the gold occurrences.

In these notes a classification is presented of the mineral associations which are found in our known auriferous matrices and allied mineral deposits. Some occurrences are included which are not proved to be auriferous or whose gold contents are even known to be unimportant, but which occur under conditions analogous to some auriferous lodes or approach them in their characters.

For the basis of the classification I use the predominant minerals among the sulphides, etc., of the ore as unaltered by surface agencies. A bare list of minerals present in any reef or in any field will not adequately represent the character of the ore, as is exemplified by Groups 1 and 2 below. The number of minerals found in a reef is sometimes considerably increased by the minerals noticed in some peculiarly complex patch. Minerals placed below as two distinct groups may be found together in the one reef, though often occurring independently of one another, this is especially the case when the groups ordinarily occur under similar conditions. It may also happen that what appears to be one reef may consist of parts of quite different mineralogical types.

The following mineral associations may be recognized, being characterized by the presence or prominence of the minerals mentioned in each case.

1. The ordinary type.—Pyrite or arsenopyrite or both, prominent among the metallic compounds; with sphalerite and galena commonly present in small quantities.
2. Galena and sphalerite prominent with pyrite.
3. Stibnite.
4. Chalcopyrite.
5. Siderite and chalcopyrite.
6. Pyrrhotite and chalcopyrite.
7. Molybdenite usually with pyrite.
8. Bismuth minerals.
9. Wolfram.
10. Cinnabar and mercury.

1. The association of minerals in this type, as ordinarily occurring, may be more fully stated as quartz, albite, dolomite, pyrite, arsenopyrite, galena, gold. Carbonaceous matter is also frequently present, sometimes as graphite.

The albite and dolomite are quite subordinate to the quartz in quantity. The sphalerite and galena, though in much less quantity than the iron minerials, and less generally distributed in the reef, are often persistently present in the richer portions. Of the two iron compounds one or other may be more prominent, or both equally so. The proportion of the metallic minerals in the reef varies greatly. There are of course many reefs of this type from which a part only of the series is recorded.

Dolomite and albite often escape notice in the bad light in the mine, but are easily recognised in most cases by their cleavages. Albite is often altered to kaolin to a considerable depth from the surface, and pholerite also occurs in the cavities of the quartz. Dolomite is often evident on the old material on the mullock heaps, as it contains a little iron carbonate which causes it to turn brown on exposure. In the Ballarat mines it occurs in four forms, impure grey dolomite in the country rock agreeing with the bedding planes or nearly so; brownish granular masses; veins in the quartz and country rock and patches in the quartz, these show district cleavage; and crystals in the cavities of the quartz. Albite and dolomite are not by any means confined to Ballarat but are widely distributed in occurrences of this type. Albite is less often recorded but this is easily accounted for by its frequent alteration and its less easy recognition.

Carbon occurs in the carbonaceous slates of the country rock, on the walls of the reefs which not infrequently follow the course of these carbonaceous slates, and as the laminations or fine sub-parallel seams in the quartz. In some cases these laminations consist in part of other minerals. Highly lustrous graphite appears to be found chiefly on the planes of movement and in rocks which have undergone more than the usual amount of alteration, as at Stawell and at Piggoreet.

Order of Crystallization.—Cavities containing quartz crystals are not uncommon, and in these we find the quartz often invested by dolomite and pyrite crystals implanted on the dolomite. These crystals are often in pyritohedral forms, whereas in the reefs distinct crystals are not common, and in the country rock they are most commonly cubes. Elsewhere (Dee River, Queensland) we have evidence of gold-nuggets moulded on quartz crystals (7), but the large masses of gold found on the indicator veins are commonly mixed with the vein quartz.

We find, however, evidence of dolomite preceding quartz as well as following it, and pyrite is found enclosed both in quartz and in dolomite.

Crystals of arsenopyrite are found in the country rock at Mt. Pleasant, Ballarat, invested by a thin layer of quartz.

Commonly no growth lines in the quartz are detected nor any crustified character in the reefs. The laminations of the reefs often noticed may be referred to the disposition of the quartz along a series of sub-parallel cracks in the original rock, or in a fault-rock, and the formation of mullocky reefs may be ascribed similarly to deposition on numerous cracks traversing shattered rocks.

We may regard as original the carbonaceous matter of the laminations and probably the grey granular dolomite bands such as occur at Ballarat East. The pyrite and arsenopyrite of the country rock and the minerals of the reefs may be regarded in the present state of our knowledge as practically contemporaneous. It must, however, be remembered that the quartz reefs of the one field are in some cases of appreciably different ages, as indicated by their relations to one another and to faults. The order of succession in the cavities must not be given too much weight in determining the general process of growth of the reef.

The masses of gold on the indicators should also receive separate investigation from the ordinary reef. To whatever extent the indicator gold may be secondary (whether that term is used with reference to the time of its formation or to its being regarded as subordinate to a general theory of vein formation), it cannot be referred to any process of surface weathering, for these rich patches are associated with easily decomposable minerals, and their characters are continuing unchanged in the deepest levels at Ballarat East.

The mode of association with other minerals and with the quartz also renders impossible any formation by a process of filtration such as recently suggested by one writer (8). Nor can they be due to obstruction to the motion of solutions in view of the nature of the general resistance to the motion of solutions through the fractures and the rocks themselves, for they are in many cases in places where the movement would be easier than usual.

Whatever may have been the sources and the general causes of the deposition of the minerals of the reefs, there is strong evidence that the position of the richer gold contents has been determined by the presence of carbonaceous matter, or at least of certain favourable slates, which are frequently carbonaceous. We find the saddle reefs of Bendigo following the course of carbonaceous beds on which there has been slipping (15). The veins of Ballarat East are often rich in crossing thin carbonaceous beds, and the so-called main reefs of the same field are richest in certain favourable slates. In many localities veins are found along the course of the carbonaceous slates, and richest in their laminated parts. The easiest explanation of the indicator masses seems to be to regard them simply as the extreme case of this more widespread feature where the favourable bed is most restricted, and the access of the solutions, by a crack nearly at right angles to the indicator, is at the same time facilitated and most definitely localised. Slipping on the carbonaceous bed might then contribute by rendering more easy the percolation of solutions along the beds, providing thus a more ready supply of the active ingredient of these impermeable beds.

Extensions and modifications of the first type. At places in a reef there sometimes appear small quantities of additional minerals. Thus from the Albion Reef, Steiglitz, Ulrich records (2) stibnite, tetrahedrite, and bournonite, with pyrite, sphalerite, gold and pholerite in the hollows of the quartz. The tetrahedrite contains arsenic, iron and zinc. From the Band and Albion Mine, Ballarat, Krausé records (5) calcite, dolomite, siderite with pyrite, chalcopyrite and tetrahedrite. Boulangerite and bournonite have also been recorded from Ballarat, but all these are rare.

Chalcopyrite occurs at a number of localities, according to Mr. R. H. Walcott, more especially Eastern Victorian (4). Mr. H. S. Whitelaw (9) describes the best reefs at Berringa as containing galena and chalcopyrite. It appears to be much commoner there than at Ballarat. Mr. O. A. L. Whitelaw (16), states that the minerals accompanying the lodes at Wood's Point are mainly pyrite and galena, with smaller quantities of sphalerite, copper carbonates and jamesonite. Mr. D. Clark (6) states that in the Cassilis ore, where the sulphides form from 10 to 60 per cent. of the ore, arsenopyrite is most prominent with pyrite, sphalerite, galena, chalcopyrite and small quantities of stibnite and bismuthinite. Magnesium and aluminium silicates are present in this ore. At the Maude and Homeward Bound Mine, Mount Wills, pyrite and arsenopyrite are accompanied by a little stibnite and a silver sulphantimonite.

The Bethanga ore contains the ordinary minerals of the first type of occurrence with the addition of those mentioned below as group 6, chalcopyrite and pyrrhotite, in quantities exceeding the sphalerite and galena (6). The Maldon field gives many examples of the addition of the same two minerals, according to the report of Mr. R. A. Moon (10), with the addition of a variety of other minerals, more especially those usually found near granitic rocks. Native antimony, stibnite and jamesonite are recorded from this field. A number of the rarer minerals here are found in veins separate from those of the ordinary type as noticed below. A remarkable variation is found near the great vugh of the Eaglehawk Reef, Maldon, the quartz being replaced by cacholong or common opal, in which were garnet, amphibole, ferrocalcite, arsenopyrite, galena and sphalerite.

Indication of gold by the minerals of the reef.—The association of richer portions of the reefs with carbonaceous material has already been noticed. With regard to the minerals of the reef themselves, it is often difficult to get exact information as to their bearing on the gold contents. It remains an open question in many cases whether the greater richness in gold is connected with the appearance of certain definite minerals or with the general increasing complexity of the mixture. An increase in the amount of the sulphides is usually accompanied by increased gold contents.

The appearance of sphalerite or galena in a reef of this type is always regarded as an indication of probably better grade stone. Opinions differ, however, as to which of these is the better, but the balance is in favour of the sphalerite. I have only once heard of an instance in which this mineral was not regarded favourably, and, in this case, the information was not very reliable or complete. It should be remembered that this mineral, being the lightest of the metallic minerals in this type of ore, is less readily saved by the ordinary processes, and its pale and lustreless appearance when crushed renders its loss less easily detected. At Maldon, according to the report already quoted (10), arsenopyrite, sphalerite, and stibnite are regarded as the most favourable to good gold. Pyrrhotite according to the same authority is good in small quantity, but in larger quantity usually bad. Ulrich (1) quotes assays from the wall of the Tiverton Reef, Maldon, as giving from material containing pyrrhotite, 2 to 10 oz. gold per ton.

Arsenopyrite seems to be usually more favourable than pyrite. A sample of slate from Ballarat East, without quartz, but with crystals of arsenopyrite, gave 3 oz. to the ton, and a roughly concentrated sample of arsenopyrite from it, 20oz. to the ton. The gold, if not in the arsenopyrite, was at least associated with it.

Mr. H. S. Whitelaw regards chalcopyrite and galena as constantly present in good gold-bearing stone at Berringa (9).

The alteration by surface waters of the minerals of these reefs gives rise to marcasite (which, however, is easily decomposed), melanterite from marcasite, copiapite; limonite; orpiment and realgar very rarely; scorodite probably much more often than recorded, pharmacosiderite, kaolin, pholerite, epsomite, and other minerals.

2. At St. Arnaud, Percydale, and other localities in the Pyrenees there is a great prominence of galena and sphalerite. Accompanying this there is, as might be expected, a larger proportion of silver in the output of the mines. Some parts of the ore yield concentrates which have been smelted for lead. The difference from the preceding type is the great quantity of these minerals which in the ordinary association of minerals are quite subordinate. In some samples of these ores the proportion of quartz also is comparatively small. The general result of assays at Percydale is said to have been that a large amount of galena tended to give high silver contents, and a large amount of sphalerite good gold contents in the ore. An assay at the Ballarat School of Mines of a sample from St. Arnaud containing galena, sphalerite, pyrite and arsenopyrite, with little quartz, gave: silver 19oz. 12dwt., gold 2oz. 19dwt. 11gr. per ton. From the Glendhu Reef, Landsborough, an assay of pyrite is quoted by Ulrich (1) as giving: silver 42oz. 9dwt. 14gr., gold 1oz. 4dwt. 11gr. The material is quoted as an example of pyrite rich in silver. It is not unlikely that it was originally associated with galena, and, if so, may be regarded as analogous to an instance from the Pinnacles, Barrier Ranges, given by Jaquet (11), where a mixture of galena and pyrrhotite had 75 per cent. of its silver in the pyrrhotite, though that mineral without galena was poor or barren.

The galena at Buchan, East Gippsland, where it is found nearly free from sphalerite, seems to contain very little gold. A sample of concentrates from the Buchan Proprietary Mine gave 55 per cent. lead, silver 21oz., gold 3dwt. per ton (12). A quartz veinstone from Gelantipy quoted in the same report gave, in different samples, up to 71 oz. of silver, but under 4dwt. of gold per ton in the highest assay.

At St. Arnaud bournonite occurs, and in the surface stone anglesite, cerussite, pyromorphite, mimetite, embolite and native copper.

3. Auriferous antimony ores.—Stibnite is only found in small quantities in the ordinary quartz reef, as in the instances already quoted. There are, however, a series of lodes in which it is the leading metallic constituent. These are mainly in the Silurian area of Central Victoria, as at Costerfield and Ringwood, but they are also found in Ordovician rocks, as at Sutton Grange, at Dunolly, and between Coimaidai and Gisborne. In any question of their origin, then, no importance could be attached to the association with Silurian rocks. Krausé mentions that the Costerfield ore has given assays as high as 9oz. gold and 80oz. silver per ton (5).

The other minerals found with the stibnite are not many nor abundant. Bournonite, cuproplumbite, and chalcostibite are noticed as rare at Costerfield (1). The few occurrences of scheelite in Victoria are not in association with the antimonial ores, though this mineral is found with them at Hillgrove, N.S.W.

Cervantite is the common alteration product of these ores, but kermesite and senarmontite are found in small quantity at a few places, and valentinite somewhat more frequently.

4. Chalcopyrite.—This mineral again is in small quantity in the ordinary type, though it frequently appears with increasing complexity. At the Thompson River Copper Mine it occurs with other copper minerals. A series of assays from this mine (13) showed only a trace of gold, and silver only as high as 6oz. per ton. It is noteworthy that these ores contain up to 3¾ per cent. nickel.

While this ore must then be regarded, so far as these assays go, as not a gold producer, it will be seen by examples already quoted that the addition of chalcopyrite to the minerals of the ordinary reef is at least sometimes favourable, though there is nothing to show that the increase in gold is derived from the chalcopyrite.

5. Siderite-chalcopyrite.—A vein composed mainly of these two minerals, with smaller quantities of pyrite, arsenopyrite.

galena and stibnite is described by Ulrich as forming a casing in a claim on the Eaglehawk Reef, Maldon (1). It assayed 17 per cent. copper and 45oz. gold per ton. On occount of the marked difference in the gold contents and the mode of occurrence I place this separate from the Thompson River ore. It approaches most nearly some of the dolomite veins which occur in the first group, but differs in the prominence of chalcopyrite.

6. Pyrrhotite chalcopyrite.—The association of these two minerals with one another is well-known in some important copper-mining localities. In Victoria they often occur in the quartz reefs, but I find no example of their occurrence in important quantity apart from other groups. They appear together as an addition to the groups. At Bethanga the addition of these two minerals to the minerals of the first group produces an ore in which copper is present in important quantity (6). At Maldon the two minerals are recorded by Moon more often from the same mine than separately (10). At Mt. William, in the Grampians, as described below, they occur with the minerals of the next group, but the comparison with mineralogically similar occurrences in the Gong Gong granite near Ballarat indicates that they may be regarded as independent. At the Gong Gong reservoir small quantities of pyrrhotite and chalcopyrite occur in the granite of a small quarry, and molybdenite is found in the same granite a mile away.

Evidence is wanting as to their influence on gold contents of the ore. At Cobar, N.S.W., these minerals with pyrite form the ore worked for copper and carry a little gold, but at a rate which would be worthless where these minerals only themselves form a small quantity of the ore.

The localities of these minerals together are mostly near granitic rocks, or where the rocks are somewhat altered. Pyrrhotite occurs at Piggoreet; here also the rocks are more schistose than usual in the bedrock of the Ballarat district, but the alteration cannot be due to the nearest granite area on the surface, as it is too far away. It seems more likely to be an outcrop of older rocks than usual.

Pyrrhotite occurs at Castlemaine and at Newstead. These also may be not far from granitic rocks.

The next three groups are found in or near the granitic rocks.

7. Molybdenite, usually with pyrite.—At McIntyre's a quartz reef contains these minerals. It is not noticed to be auriferous except on the indirect evidence that the alluvial gold of some gullies appears to start in its vicinity (14). This reef is 100 feet from the ill-defined McEvoy's Reef, from which three masses were obtained in close proximity to one another, and weighing about 800oz. each. Another reef on Mt. Moliagul contains the same two minerals, with the addition of arsenopyrite (14). It may be noticed that arsenopyrite is known as an accessory in the granite rocks at Morang.

At the Mt. William goldfield in the Grampians the gold was largely derived from the neighbourhood of one or more mineralised bands in the granodiorite. Part of the so-called alluvial was simply decomposed granodiorite in situ, carrying fine gold. This led to some remarkable views on the field as to the probable course of supposed deep leads. On these mineralised bands the quartz was in very thin veins for the most part, but at places hollow swellings occurred, lined with quartz crystals of a somewhat amethystine colour. In the alluvial there were many amethyst crystals and quartz crystals with marked zoned structure. The miners stated that the distribution of the gold was about that of the amethysts. Some of the claims worked decomposed seams in the granitic rock and were said to be obtaining payable results. The mineralised bands contained, with these small quartz veins and on joint plane without quartz, molybdenite with a smaller quantity ot pyrite, and in some places chalcopyrite and pyrrhotite. Scheelite was also said to occur, but I obtained no certain information on this point. Though the undecomposed rock carrying these minerals was not being worked there can be little doubt that a great part of the gold at least was derived from such occurrences, as gold was being obtained in seams in the partly weathered rock, in thoroughly decomposed rock, and in alluvial, of which some of the characteristic constituents were clearly derived from such bands.

8. Bismuth minerals.—These were noticed by Ulrich from Kingower and elsewhere (1, 2). They occur also at Redbank

near Avoca; among those from this locality there is a little tetradymite. Bismuth minerals with traces of tellurium occur also at Mallacoota (4) and tetradymite is also recorded from Maldon (4). A part of the bismuth at Maldon occurs in the rare mineral maldonite (2). Native bismuth, bismuthinite, bismite and bismutite are recorded from Maldon.

9. Wolfram.—In the localities of which I have most detail this mineral is associated with one of the preceding groups, but it seems best to place it separately. There is no evidence of any influence on gold contents, and it would probably be of more value for itself if in quantity than for its influence on the gold.

The following examples show the minerals of the last three groups associated with one another.

Reef on Sandy Creek, Maldon.—Native bismuth, hematite, schorl and wolfram. No statement as to gold contents (1).

Reef on the Nuggetty Range, Maldon.—Quartz, orthoclase, schorl, mica, molybdenite, wolfram, scheelite. It is contained in granitic rock. Gold is not mentioned (2). Rock crystal and cairngorm occur in the cavities. Reefs of this kind are no doubt the source of the quartz crystals containing, in different instances, molybdenite, scheelite and schorl, which have been found in the neighbouring Bradford Lead.

Superb Reef, Linton, near the granite, contains bismuth, bismuthinite, bismutite, molybdenite, wolfram, besides quartz crystals containing schorl, and rutile (5).

It may be noticed that the supposed columbite at Maldon has been shown to be rutile (4), and that Ulrich records titanium dioxide from Steiglitz (2).

10. The material worked for mercury on the Jamieson River consists, in samples I have received, of a clay rock with quartz veins containing in both cinnabar and mercury. Gold is said to be present. Cinnabar is also recorded from near Bullumwaal, found in small broken fragments on the surface near a quartz reef (4).

Campbell's Reef, Moyston, is mentioned by Ulrich (2) as containing strong irregular veins and patches of calcite, sometimes with galena and pyrite (2). It would seem most likely that these are analogous to the dolomite veins and patches at Ballarat and other places, and it need not be for this reason separated from the first type.

Manganese oxides are sometimes abundant in the outcrops of quartz reefs. A source of this manganese is not always evident. In some cases, as at Linton, it may be derived from wolfram. Sphalerite may also contribute to it. One analysis of psilomelane from Maldon showed nearly 3 per cent. cobalt oxide. Rhodochrosite is recorded from Clunes (1). A pink mineral in a very thin layer or film is sometimes found at Ballarat, but examination showed neither manganese nor cobalt.

I have in my possession a sample of zinc from Bamganie, said to have been obtained in workings in the 80ft. level of one of the mines. There was nothing in the circumstances under which I obtained it to suggest any doubt as to its genuineness.

I have attempted this classification of the auriferous deposits with a view to arranging the more important parts of our present information, and to suggest a basis for more complete and more systematic observations in the future. Where old records are quoted without any explicit reference they are contained in Atkinson's List of Victorian Minerals (3), and in Walcott's Additions (4). These papers have greatly facilitated the work of this classification.

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16. Memoirs of the Geological Survey of Victoria, No. 3, Wood's Point, by O. A. L. Whitelaw, Department of Mines, Melbourne, 1905.

END OF VOL. XVIII., PART I.

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[Proc. Roy. Soc. Victoria, 18 (N.S.), Pt. II., 1905].

Art. VI.—*Catalogue of the Marine Shells of Victoria,*

Part IX.;

With complete Index to the whole Catalogue.

By G. B. PRITCHARD and J. H. GATLIFF.

[Read 14th December, 1905.]

The present part includes additional notes and references on the species already referred to by us, together with corrections and alterations, as well as particulars on additional species which have been obtained since the publication of the various parts. The additional species here dealt with number 58, so that with the previous total of 707, our list of Victorian Marine Shells now amounts to 765 species.

An Index to the whole catalogue is appended, giving references to the genera and species, but not to the sub-genera, and we have to thank Mr. R. A. Bastow for its compilation.

We would draw attention to a recent paper by W. H. Dall, entitled "An Historical and Systematic Review of the Frog Shells and Tritons," published by the Smithsonian Institution, Volume xlvii., 1904, pp. 114-144, in which he re-classifies the shells which we have regarded as being comprised in the family Lotoriidae, and refers to some of our species.

Errata.

Part	I., p. 238,	line	7,	read	12 for 11.
,,	I., p. ,,	,,	8,	,,	61 for 62.
,,	I., p. 239,	,,	5,		delete Bay.
,,	I., p. 253,	,,	14,	read	p. 65, No. 90, for p. 32, No. 4.
,,	I., p. 259,	,,	35,	,,	adelaidense for adelaidensis.
,,	I., p. 268,	,,	28,	,,	Ranella for Renella.
,,	I., p. 280,	,,	26,	,,	1804 for 1880.
,,	II., p. 185,	,,	2,	,,	12 for 11.
,,	II., p. ,,	,,	3,	,,	61 for 60 and 85 for 83.
,,	II., p. ,,	,,	5,	,,	59 for 58.
,,	III., p. 170,	,,	2,	,,	85 for 83.

Part III., p. 170, line 3, read 59 for 58.
,, III., p. ,, ,, 4, ,, 78 for 77.
,, III., p. ,, ,, 7, ,, 222 for 218.
,, III., p. 190, ,, 19, ,, Cassis for Carris.
,, III., p. 191, ,, 35, ,, Abbild for Abh.
,, IV., p. 142, ,, 20, ,, 1899 for 1889.
,, IV., p. 149, ,, 2, ,, Angas for Angus.
,, IV., p. 151, ,, 29, 30, read Angas for Angus.
,, IV., p. 156, ,, 29, read 1887 for 1886.
,, V., p. 121, ,, 3, ,, 22 for 220 and delete a.
,, V., p. 125, ,, 21, ,, Gibbula for Gibulla.
,, V., p. 136, ,, 10, ,, perspectivus for perspectious.
,, VI., p. 197, ,, 31, ,, Acmaea for Acamea.
,, VIII., p. 236, ,, 21, insert Vic. after P.R.S.
,, VIII., p. 238, ,, 35, read Jukes' for Juke's.
,, VIII., p. 265, ,, 16, ,, Shoreham for Storeham.

MUREX DENUDATUS, Perry.

See part i., p. 253.

1811. Triplex frondosa, Perry. Conch. pl. 6. f. 1 (non Murex frondosus, Lam., 1803).
1811. Triplex denudata, Perry. Id., pl. 7, f. 2.
1833. Murex australis, Quoy and Gaimard. Astrolabe Zool., vol. ii., p. 356.
1902. Murex denudatus, Hedley. P.L.S. N.S.W., p. 26.
1902. Murex denudatus, Gatliff. V.N.. vol. xix., p 76.
1902. Murex australis, Kesteven. P.L.S. N.S.W., vol. xxvi., part 4, pp. 709-711, pl. 35, f. 10, 11.

Obs.—One of us when recently visiting Paris found that our reference to M. australis, Poirier, should be p. 65, No. 90, instead of p. 32, No. 4.

MUREX ANGASI, Crosse.

See part i., p. 252.

1902. Murex angasi, Kesteven. P.L.S. N.S.W., vol. xxvi., pt. 4, p. 711, pl. 36, f. 6, 7.

TYPHIS SYRINGIANUS, Hedley.

1902. Typhis arcuatus, Pritchard and Gatliff. P.R.S. Vic., vol. x., p. 255.
1903. Typhis syringianus, Hedley. Mem. Aust. Mus., vol. iv., part 6. p. 381. f. 94.

Obs.—In the paper above referred to Mr. Hedley states that our shell is not T. arcuatus, Hinds, which is a South African species.

TROPHON BRAZIERI, T. Woods.

See part i., p. 257.

1900. Trophon brazieri, Hedley. P.L.S. N.S.W., p. 726, f. 23.

TROPHON EBURNEA, Petterd.

See part i., p. 258.

1901. Cantharus eburneus, Tate and May. P.L.S. N.S.W., p. 357, f. 1.

Obs.—In our former remarks on this species, we stated we were not satisfied with the generic position in which it was placed, and we do not think the classification of Tate and May an improvement. The shell measures 16 by 8 mm., is white, fragile, and semi-translucent, their figure quoted might lead one to take it as representing a larger and more robust form.

LOTORIUM RUBICUNDA, Perry.

1811. Septa rubicunda, Perry. Conch., pl. 14, f. 4.
1898. Lotorium australis, Prit. and Gat. P.R.S. Vic., vol. x., p. 262.
1902. Lotorium rubicunda, Gatliff. V.N., vol. xix, p. 76.

LOTORIUM EXARATUM, Reeve.

See part i., p. 265.

Obs.—Mr. Chas. Hedley, P.L.S. N.S.W., 1902, p. 26, considers that Monoplex cornutus, Perry, Conch., pl. 3, f. 1, represents the above species. We do not coincide in this opinion, and Dr. Dall in his paper from the Smithsonian Miscellaneous Collections, vol. xlvii., p. 123, referring to Perry's figures, states: "One, cornutus, Perry, is unidentifiable, certainly not exaratum, Reeve, to which it has been referred."

LOTORIUM SPENGLERI, Chemnitz.

See part i., pp. 263, 264, 265.

1902. Tritonium spengleri, Kesteven. P.L.S. N.S.W., vol. xxvi., pt. 4, p. 713, pl. 36, f. 8, 9.

LOTORIUM (ARGOBUCCINUM) AUSTRALASIA, Perry.

See part i., p. 268.

Lotorium australasia, Perry, displaces L. leucostoma, Lamarck.

1811. Biplex australasia, Perry. Conch., pl. 4, f. 2, 4.
1902. Ranella leucostoma, Hedley. P.L.S. N.S.W., vol. xxvi., pt. 4, p. 631.
1902. Gyrineum australasia, Kesteven. Id., pp. 713, 714, pl. 36, f. 1.
1902. Lotorium australasia, Gatliff. V.N., vol. xix., No. 5, p. 76.

LOTORIUM PARKINSONIANUM, Perry.

1811. Septa parkinsonia, Perry. Conch., pl. 14, f. 1.
1842. Triton fusiforme, Kiener. Icon. Coq. Viv., vol. xvi., p. 36, pl. 5, f. 2.
1844. Triton fusiformis, Reeve. Conch. Icon., vol. ii., pl. 2, f. 16.
1881. Triton fusiforme, Tryon. Man. Conch., vol. iii., p. 11, pl. 4, f. 22.

1902. Tritonium fusiforme, Kesteven. P.L.S. N.S.W., vol. xxvi., pt. 4, p. 712, pl. 35, f. 3-5.
1902. Lotorium parkinsonianum, Gatliff. V.N., vol. xix., p. 76.
1903. Lotorium parkinsonianum, Hedley. Mem. Aust. Mus., vol. iv., pt. 6, p. 340.

Hab.—Cape Everard (E. O. Thiele).

Obs.—This is an interesting addition to our fauna, as showing the southern extension of what has hitherto been regarded as a New South Wales species, as well as being a living survival of a type very abundant in the older Tertiaries of Southern Australia.

FUSUS NOVAEHOLLANDIAE, Reeve.

See part i., p. 269.

Obs.—The type of this species is in the National Museum, Melbourne.

FUSUS UNDULATUS, Perry.

1811. Fusus undulatus, Perry. Conch., pl. 54, f. 1.
1898. Fusus pyrulatus, Pritchard and Gatliff. P.R.S. Vic., vol. x., p. 270.
1902. Fusus undulatus, Gatliff. V.N., vol. xix., p. 76.

FASCIOLARIA AUSTRALASIA, Perry.

1811. Pyrula australasia, Perry. Conch., pl. 54, f. 4.
1898. Fasciolaria coronata, Pritchard and Gatliff. P.R.S. Vic., vol. x., p. 271.
1902. Fasciolaria australasia, Gatliff. V.N., vol. xix., p. 76.

Obs.—Perry's figure represents the form F. fusiformis, Valenciennes.

LATIRUS CLARKEI, T. Woods.

See part i., p. 272.

1901. Euthria clarkei, Hedley. P.L.S. N.S.W., vol. xxv., p. 726, f. 24.

1901. Cantharus clarkei, Tate and May. Id., vol. xxvi., p. 357.

SIPHONALIA DILATATA, Quoy and Gaimard.

See part i., p. 272.

Obs.—The type of Fusus pastinaca, Reeve, is in the National Museum, Melbourne.

PURPURA SERTATA, Hedley.

1903. Purpura sertata, Hedley. Mem. Austr. Mus., vol. iv., part 6. p. 382, 383, f. 95, 96.

Hab.—Port Albert (Thos. Worcester).

PURPURA TRITONIFORMIS, Blainville.

1832. Purpura tritoniformis, Blainville. Nouv. Ann. du Mus., vol. i., p. 221, pl. 10, f. 10.

1898. Cominella (Agnewia) tritoniformis, Pritchard and Gatliff. P.R.S. Vic., p. 275.

1902. Purpura tritoniformis, Kesteven. P.L.S. N.S.W., p. 533-538, pl. 29, f. 2, 3, 5, 7.

Hab.—Western Port, etc.

Obs.—Mr. Kesteven in the above paper deals fully with this shell, and from evidence given by the embryonic form, the radula, and operculum, concludes that it was originally placed by Blainville in the genus to which it correctly belongs.

Genus Truncaria, Adams and Reeve.

TRUNCARIA AUSTRALIS, Angas.

1877. Truncaria australis, Angas. P.Z.S. Lond., p. 172, pl. 26, f. 5.

Hab.—Flinders, Western Port; Port Albert (T. Worcester).

VOLUTA ROADKNIGHTAE, McCoy.

See part i., p. 282.

1901. Voluta roadknightae, Spencer. P. Mal. S. Lond., vol. iv., p. 184.

Obs.—In our previous reference we erroneously stated that the type specimen was obtained at Portland. The shell from that locality exhibited in the National Museum is not the type. In the reference above given Prof. Spencer states: "The type specimen came . . . from Ninety-mile Beach, on the Victorian coast . . . though not in the public exhibition was still preserved in the National Museum." Both of us have been permitted to examine it, and it is beyond doubt the specimen described by Prof. McCoy, the measurements and features given by him exactly corresponding.

MITRA PELLUCIDA, Tate.

1887. Mitra pellucida, Tate. T.R.S. S.A., vol. ix., p. 63, pl. 4, f. 13.

Hab.—San Remo, Western Port.

Obs.—A small, white, pellucid species.

TURRICULA TASMANICA, T. Woods.

See part ii., p. 188.

1903. Turricula tasmanica, May. P.R.S. Tas., p. 109, f. 1, 2.

Obs.—Mr. May in the paper named "On Tenison Woods' types in the Tasmanian Museum, Hobart," gives two figures. Number 1 he considers the typical form. We have not found it here. Number 2 is on the same card as number 1, and is the form we find here.

MARGINELLA PUMILIO, Tate and May.

See part ii., p. 192.

1876. Marginella minutissima, T. Woods. P.R.S. Tas., p. 27 (non Michelin).

1901. Marginella pumilio (nom. mut.), Tate and May. P.L.S. N.S.W., p. 363, pl. 26, f. 79.

Hab.—Brighton (National Museum). Dredged about 7 fathoms, off Rhyll, Western Port.

Obs.—One sinistral specimen also dredged in the last named locality.

MARGINELLA WHANI, Pritchard and Gatliff.

1900. Marginella whani, Pritchard and Gatliff. P.R.S. Vic., vol. xiii., part 1, p. 137, pl. 21, f. 5, 6.

Hab.—Port Fairy (Rev. T. Whan), Carrum Beach, Port Phillip (Thos. Worcester).

MARGINELLA PISUM, Reeve.

See part ii., p. 192.

1865. Marginella pisum, Reeve. Conch. Icon., vol. xv., pl. 27, f. 156.
1877. Marginella (Cryptospira) cypraeoides, T. Woods P.R.S. Tas., p. 122 (non Anton, 1839).
1900. Marginella tenisoni, Pritchard. V.N., p. 55.
1903. Marginella cypraeoides, May. P.R.S. Tas., p. 109, f. 3.

MARGINELLA CYMBALUM, Tate.

1878. Marginella cymbalum, Tate. T.R.S. S.A., p. 87.
1901. Marginella cymbalum, Tate and May. P.L.S. N.S.W., p. 364, pl. 26, f. 83.

Hab.—Port Phillip; Shoreham, Western Port; Portland.

MARGINELLA TRIDENTATA, Tate.

1878. Marginella tridentata, Tate. T.R.S. S.A., p. 87.
1901. Marginella tridentata, Tate and May. P.L.S. N.S.W., p. 363, pl. 26, f. 81.

Hab.—Port Fairy.

MARGINELLA STRANGEI, Angas.

1877. Marginella strangei, Angas. P.Z.S. Lond., p. 172, pl. 26, f. 8.
1902. Marginella strangei. Hedley. P.L.S. N.S.W., p. 18, fig. in text.

Hab.—Port Fairy (Whan).

MARGINELLA SUBBULBOSA, Tate.

1878. Marginella subbulbosa, Tate. T.R.S. S.A., p. 86.
1902. Marginella subbulbosa, Hedley. P.L.S. N.S.W., p 18, fig. in text.

Hab.—Portsea, Port Phillip.

Obs.—Mr. Hedley in the paper above quoted, gives figures of the two foregoing species, and states that they are valid, and Messrs. Tate and May were wrong in uniting them.

MARGINELLA LAEVIGATA, Brazier.

1876. Marginella lavigata, Brazier. P.L.S. N.S.W., p. 225.
1886. Marginella valida, Watson. Chall., vol. xv., p. 267, pl. 16, f. 3.
1901. Marginella laevigata, Hedley. Records Australian Museum, vol. iv., p. 123, pl. 16, f. 5.
1903. Marginella laevigata, Hedley. Memoirs Australian Museum, vol. iv., p. 365, f. 89.

Hab.—Dredged off Rhyll, Western Port, about 7 fathoms.

Genus **Pseudamycla**, Pace, 1902.

PSEUDAMYCLA DERMESTOIDEA, Lamarck.

1822. Buccinum dermestoideum, Lamarck. Anim. S. Vert., vol. vii., p. 275.
1899. Columbella lineolata, Pritchard and Gatliff. P.R.S. Vic., p. 199.

1902. Pseudamycla dermestoidea, Pace. P. Mal. S. Lond., p. 254-257, f. 1-10.

1903. Pseudamycla dermestoidea, Pace. Id., p. 267, 268.

Hab.—Portland. Lorne, Sorrento (Ocean Beach), Port Phillip, Western Port.

Obs.—In the 1902 paper referred to, Mr. Pace enters fully into the history of the confusion regarding this species, which in the first instance had the erroneous locality "West Indies" attributed to it, from the characters of the radula (of which he gives figures), he separates it from the Columbellidae, and makes the shell the type of the above new genus, which he states may be best placed among the Pisaniinae.

PSEUDAMYCLA MILTOSTOMA, T. Woods.

1899. Columbella miltostoma, Pritchard and Gatliff. P.R.S. Vic., vol. xi., p. 200.

1903, Pseudamycla miltostoma, Pace. P. Mal. S. Lond., p. 268.

Hab.—Flinders, San Remo, and dredged off Rhyll, Western Port.

Obs.—Mr. Pace in the paper above referred to, gives full particulars of the appearance of the shell, and the external characters of the animal.

COLUMBELLA SEMICONVEXA, Lamarck.

See part ii., p. 197.

1902. Columbella semiconvexa, Kesteven. P.L.S. N.S.W., vol. xxvii., pt. 1, pp. 5, 6, f. 7.

COLUMBELLA FILOSA, Angas.

1867. Aesopus filosus, Angas. P.Z.S. Lond., p. 111, pl. 13, f. 6. and p. 195, No. 56.

Hab.—Dredged off Rhyll, Western Port, about 7 fathoms.

Obs.—An elongate, spirally lirate species.

COLUMBELLA SMITHI, Angas.

1867. Columbella lentiginosa, Angas. P.Z.S. Lond., p. 195 (non. Hinds).
1877. Columbella smithi, Angas. Id., p. 172, pl. 26, f. 7.
1897. Columbella (Anachis) smithi, Kobelt. Conch. Cab., p. 255, pl. 34, f. 9.

Hab.—San Remo, Western Port.

Obs.—A small species, longitudinally plicate.

TEREBRA INCONSPICUA, Pritchard and Gatliff.

1902. Terebra inconspicua, Pritchard and Gatliff. P.R.S. Vic., vol. xiv., part 2, p. 181, pl. 9, f. 2.

Hab.—Dredged off Rhyll (about 6 fathoms) and San Remo, Western Port.

Obs.—Larger dead specimens have lately been dredged off Rhyll, measuring length 22 mm., greatest breadth, 8.5 mm.

TEREBRA FICTILIS, Hinds.

1844. Terebra fictilis, Hinds. Thes. Conch., vol. i., p. 183, pl. 45, f. 109, 110.
1867. Terebra assimilis, Angas. P.Z.S. Lond., p. 111, pl. 13, f. 8.
1900. Terebra fictilis, Hedley. P.L.S. N.S.W., p. 509, pl. 26, f. 14.
1903. Terebra fictilis, Hedley. Memoirs Australian Museum, vol. iv., p. 384.

Hab.—Port Fairy (Rev. T. Whan). Dredged 7 fathoms, off Rhyll, Western Port.

DRILLIA TRAILLI, Hutton.

1873. Pleurotoma traillí, Hutton. Cat. N.Z. Moll., p. 11.
1880. Pleurotoma trailli, Hutton. Man. N.Z., Moll., p. 42.
1900. Drillia aemula, Pritchard and Gatliff. P.R.S. Vic., vol. xii., part 2, p. 171.

1905. Surcula trailli, Suter. P. Mal. S. Lond., vol. vi., p. 201.

Obs.—Mr. Suter states that the type is in the Colonial Museum, Wellington, N.Z., and beyond doubt the same species as D. aemula, Angas. Tryon, therefore, is right in his treatment of the species, but we are still unable to consider that his two figures correctly represent the same shell. The form, we find, is fairly depicted on his pl. 12, f. 37, as previously quoted by us.

MANGILIA (?) INCERTA, Pritchard and Gatliff.

1902. Mangilia (?) incerta, Pritchard and Gatliff. P.R.S. Vic., vol. xiv., part 2, p. 180, pl. 9, f. 1.

Hab.—Dredged off Rhyll, Western Port.

MANGILIA ST. GALLAE, T. Woods.

1877. Mangelia St. Gallae, T. Woods. P.R.S. Tas., p. 137.

1901. Mangelia St. Gallae, Tate and May. P.L.S. N.S.W., p. 369, pl. 24, f. 33.

Hab.—Dredged off Rhyll, Western Port.

CITHARA KINGENENSIS, Petterd.

See part iii., p. 176.

1879. Daphnella kingenensis, Petterd. Jour. of Conch., vol. ii., p. 102.

1900. Cithara, cognata, Pritchard and Gatliff. P.R.S. Vic., vol. xii., p. 176.

CLATHURELLA DENSEPLICATA, Dunker.

Pleurotoma denseplicata, Dunker. Mal. Blat., vol. xviii., p. 159.

1884. Drillia denseplicata, Tryon. Man. Conch., vol. vi., p. 203, pl. 11, f. 7.

1887. Drillia denseplicata, Kobelt. Conch. Cab., p. 107, pl. 23, f. 7 and 9 only.
1900. Clathurella philomena, Pritchard and Gatliff, P.R.S. Vic., vol. xii., part 2, p. 177.

Hab.—Dredged Western Port.

Obs.—This is the elongated form referred to in the former part of the Catalogue. Tryon gives the length 13 mm.; we have one measuring 17 mm. When living, the shell is suffused with a purple tint.

MITROMORPHA FLINDERSI, Pritchard and Gatliff.

1879. Columbella alba, Petterd. Jour. of Conch., vol. ii., p. 104 (non Jeffreys, 1842).
1897. Columbella (Mitrella) alba, Kobelt. Conch. Cab., p. 288.
1898. Columbella alba, Tate. P.R.S. N.S.W., p. 397.
1899. Mitromorpha flindersi, Pritchard and Gatliff. P.R.S. Vic., p. 104, pl. 8, f. 6.
1901. Mitromorpha alba, Tate and May. P.L.S. N.S.W., p. 372 and p. 455.

Hab.—Western Port.

Obs.—Prof. Tate in the reference above given in a paper on the Fauna of the Older Tertiary of Australia does not state definitely that he considers C. alba, Petterd, to be a Mitromorpha, but says it has a very close resemblance to M. lirata, A. Adams.

Genus **Daphnella**, Hinds, 1844.

DAPHNELLA FRAGILIS, Reeve.

1845. Pleurotoma fragilis, Reeve. P.Z.S. Lond., p. 111.
1845. Pleurotoma fragilis, Reeve. Conch., Icon., vol. i., pl. 21, f. 179.
1846. Pleurotoma lymnaeaeformis, Reeve. Id., pl. 35, f. 325.
1896. Daphnella fragilis, Sowerby. P. Mal., S. Lond., p. 26, No. 10.

Hab.—Dredged off Rhyll, Western Port, about 7 fathoms.

DAPHNELLA MIMICA Sowerby.

1896. Daphnella (Teres) mimica, Sowerby. P. Mal., S. Lond., p. 27, pl. 3, f. 10.

Hab.—Same as the preceding species.

Obs.—We also there obtained the variety fusca, described by Sowerby in the paper above referred to.

DAPHNELLA TASMANICA, T. Woods.

1877. Daphnella tasmanica, T. Woods. P.R.S. Tas., p. 138, No. 19.

1901. Daphnella tasmanica, Hedley. P.L.S. N.S.W., p. 725, f. 21.

1902. Daphnella tasmanica, Hedley. Id., p. 700.

Hab.—Dredged off Rhyll, Western Port, about 7 fathoms.

Genus **Donovania**, Bucq., Dautz., and Dollf., 1883.

DONOVANIA FENESTRATA, Tate and May.

1900. Donovania fenestrata, Tate and May. T.R.S. S.A., p. 94.

1901. Donovania fenestrata, Tate and May. P.L.S. N.S.W., p. 372, pl. 24, f. 36.

Hab.—Flinders, Western Port.

Obs.—Type in Hobart Museum.

CONUS APLUSTRE, Reeve.

1843. Conus aplustre, Reeve. P.Z.S. Lond., p. 171.

1843. Conus aplustre, Reeve. Conch., Icon., vol. i., pl. 30, f. 170.

1858. Conus aplustre, Sowerby. Thes. Conch., vol. iii., p. 32, pl. 205, f. 448.

Hab.—San Remo, Western Port (Mrs. A. F. Kenyon).

NATICA SHOREHAMI, Pritchard and Gatliff.

See part iii., p. 195.

1900. Natica shorehami, Pritchard and Gatliff, P.R.S. Vic., vol. xiii., n. s., pt. 1, p. 131, pl. 20, f. 4.

NATICA TENISONI, Tate and May.

1876. Natica nana, T. Woods. P.R.S. Tas., p. 149 (non Moller).

1900. Natica tenisoni, Tate and May. T.R.S. S.A., p. 94.

Hab.—Flinders, Western Port.

CREPIDULA ACULEATA, Gmelin.

1790. Patella aculeata, Gmelin. Syst., Nat., p. 3693, No. 6.

1822. Crepidula aculeata, Lamarck. Anim., S. Vert., vol. vi., p. 25, No. 3.

1859. Crepidula (Crepipatella) aculeata, Chenu. Man., Conch., vol. i., p. 327, f. 2355, 2356.

1886. Crepidula aculeata, Tryon. Man., Conch., vol. viii., p. 129, pl. 39, f. 61-65.

Hab.—Port Phillip.

Genus Capulus, Montfort, 1810.

CAPULUS VIOLACEUS, Angas.

1857. Capulus violaceus, Angas. P.Z.S. Lond., p. 114, pl. 13, f. 23.

1867. Capulus violaceus, Angas. Id., p. 212, No. 160.

1902. Capulus violaceus, Kesteven. P.L.S. N.S.W., p. 714, pl. 35, f. 7-9.

Hab.—Ocean Beach, Point Nepean; dredged about 7 fathoms, off Rhyll, Western Port.

TURRITELLA SUBSQUAMOSA, Dunker.

1871. Turritella subsquamosa, Dunker. Mal., Blatt, vol. xviii., p. 152.

1900. Turritella oxyacris, Pritchard and Gatliff. P.R.S. Vic., vol. xii., part 2, p. 202.

1900. Turritella lamellosa, Pritchard and Gatliff. Id., p. 203.

1903. Turritella subsquamosa, Hedley. Mem. Austr. Mus., vol. iv., part 6, p. 347.

Hab.—Dredged off Rhyll, Western Port.

TURRITELLA VITTATA, Hutton.

1873. Turritella vittata, Hutton. Cat., N.Z., Moll., p. 29.

1880. Turritella vittata, Hutton. Man., N.Z., Moll., p. 84.

1900. Turritella carlottae, Prit. and Gat. P.R.S. Vic., vol. xii., p. 204.

Obs.—Mr. Suter sends us examples of T. vittata, Hutton, and says it is the same as T. carlottae, Watson.

VERMETUS CAPERATUS, Tate and May.

1900. Thylacodes caperatus, Tate and May. T.R.S. S.A., p. 94.

1901. Thylacodes (?) caperatus, Tate and May. P.L.S. N.S.W., p. 377, pl. 23, f. 14.

1902. Vermetus caperatus, Hedley. Id., p. 19, figures in text.

Hab.—Anglesea.

Obs.—A small brown species, diameter of tube 1 mm.

SCALA MINUTULA, Tate and May.

1900. Scalaria (Acrilla) minutula, Tate and May. T.R.S. S.A., vol. xxiv., part 2, p. 95.

1901. Scalaria minutula, Tate and May. P.L.S. N.S.W., p. 379, pl. 25, f. 41.

1905. Scala minutula, Hedley. Rec. Aust. Mus., vol. vi., p. 52, f. 19.

Hab.—Portsea, Port Phillip; Shoreham, Western Port.

Obs.—A minute brown shell, length given as 2 mm. with five spire whorls. We have specimens before us 3.50 mm. in length with seven spire whorls.

CROSSEA CANCELLATA, T. Woods.

1878. Crossea cancellata. T. Woods. P.R.S. Tas., p. 122. 122.
1882. Delphinula johnstoni. Beddome. Id., p. 31, and 1883, p. 169.
1901. Crosseia cancellata. Tate and May. P.L.S. N.S.W., p. 380, pl. 23, f. 1.

Hab.—Dredged off Rhyll, Western Port, about 7 fathoms.

Genus **Lippistes**, Montfort, 1810.

See part iv., p. 142.

LIPPISTES BLAINVILLEANUS, Petit.

1851. Trichotropis blainvilleanus, Petit. Jour. de Conch., p. 22, pl. 1, f. 5.
1877. Trichotropis tricarinata, Brazier. P.L.S. N.S.W., vol. i., p. 312.
1887. Separatista blainvilleana, Tryon. Man. Conch., vol. ix., p. 45, pl. 8, f. 69.
1899. Trichotropis gabrieli, Pritchard and Gatliff. P.R.S. Vic., p. 183, pl. 20, f. 7.
1899. Separatista blainvilleana, Melvill and Standen. J.L.S., vol. xxvii., p. 169.
1901. Separatista separatista, Hedley. Records Aust. Mus., vol. iv., p. 126, pl. 16, f. 22 (non Dillwyn).
1902. Lippistes separatista, Hedley. P.L.S. N.S.W., p. 23, 24 (non Dillwyn).

Obs.—When we described T. gabrieli it was from a single specimen, which has only two encircling carinae on the body whorl. Other shells have been since dredged in the same locality, and in every instance the body whorl is tricarinate. Examination of the type shows that the growth of the penultimate whorl has been interfered with, and apparently this accounts for its only having two carinae on the body whorl. As Lippistes had not been recorded from our Southern waters, we concluded it was new. We are now constrained to regard it as an abnormal form of L. blainvilleanus, and are indebted to Mr. C. Hedley for the good work in his papers quoted in clearing up the difficulties surrounding the genus. Since the publication of his paper referred to, he has written to us stating that he now considers L. separatista, Dillwyn, distinct from L. blainvilleanus, Petit, and remarks upon the curious distribution of the species. He dredged it in 10 fathoms off the mouth of the Batavia River, Gulf of Carpentaria, and in 17-20 fathoms, off Masthead Island, Capricorn Group, Queensland. Melvill and Standen record it from Flinders' Entrance, near Mer, 20 fathoms, but there is no record of its occurring in New South Wales or South Australia.

CAECUM AMPUTATUM, Hedley.

1893. Caecum amputatum, Hedley. P.L.S. N.S.W., p. 504, fig. in text.

Hab.—Ocean Beach, Point Nepean.

Genus **Strebloceras**, Carpenter, 1858.

See part iv., p. 144. Caecum, sp.

STREBLOCERAS CYGNICOLLIS, Hedley.

1904. Strebloceras cygnicollis, Hedley. P.L.S. N.S.W., p. 189, pl. 8, f. 12-14.

Hab.—Port Albert (T. Worcester).

EULIMA INDISCRETA, Tate.

See part iv., p. 145.

Obs.—Tate, when describing this species in 1898, draws attention to the fact of E. petterdi, Beddome, being a close ally, and reproduces Beddome's original description, showing points of difference; yet subsequently in Tate and May's Tasmanian Census we find that E. petterdi, Beddome, though described in 1883, is subordinated to E. indiscreta, Tate, as a synonym. This treatment appears somewhat perplexing.

EULIMA TENISONI, Tryon.

See part iv., p. 145.

1901. Eulima tenisoni. Tate and May. P.L.S. N.S.W., p. 380, pl. 25, f. 60, and p. 457.

Obs.—Messrs. Tate and May state that Tryon has figured a shell (referred to by us previously) that is not T. Woods' species; the type of the latter is in the Hobart Museum, and they have named the shell Tryon has figured, E. tryoni.

EULIMA TRYONI, Tate and May.

1886. Eulima tenisoni, Tryon. Man. Conch., vol. viii., non. p. 269, but figure only, 16, pl. 68.

1900. Eulima tryoni, Tate and May. T.R.S. S.A., vol. xxiv., p. 96.

1901. Eulima tryoni, Tate and May. P.L.S. N.S.W., p. 381.

Hab.—Victoria (Tate and May).

EULIMA INFLATA, Tate and May.

1900. Eulima inflata, Tate and May. T.R.S. S.A., p. 95.

1901. Eulima inflata, Tate and May. P.L.S. N.S.W., p. 381, pl. 25, f. 58.

Hab.—Parasitic on starfish dredged off Shoreham, Western Port; (F. E. Grant), dredged off Rhyll; St. Kilda Beach, Port Phillip; (M. Edith Gatliff).

EULIMA ORTHOPLEURA, Tate.

1898. Eulima orthopleura, Tate. T.R.S. S.A., p. 80, pl. 4, f. 1.

Hab.—Port Campbell.

TURBONILLA (ONDINA) HARRISSONI, Tate and May.

1900. Syrnola harrissoni, Tate and May. P.L.S. S.A., p. 96.

1901. Syrnola harrissoni, Tate and May. P.L.S. N.S.W., p. 382, pl. 25, f. 54.

Hab.—Portsea, Port Phillip.

STYLIFER PETTERDI, Tate and May.

See part iv., p. 146.

1884. Stylifer robusta, Petterd. Jour. of Conch., p. 140, No. 22 (non Pease).
1900. Stylifer petterdi, Tate and May (nom mut). T.R.S. S.A., p. 96.
1901. Stylifer petterdi, Hedley. P.L.S. N.S.W., p. 729, f. 27.

STYLIFER LODDERAE, Petterd.

See part iv., p. 147.

1900. Stylifer lodderae, Hedley. P.L.S. N.S.W., p. 92, f. in text.

Obs.—S. marginata, T. Woods (Eulima), is quoted by Tate and May in their Tasmanian Census, p. 381, as replacing the above species, with the remark, however, that the specimen, presumably the type, is "immature and imperfect." May when subsequently dealing with T. Woods' types omits to mention S. marginata.

ODOSTOMIA DEPLEXA, Tate and May.

1900. Odontostomia deplexa, Tate and May. T.S.S. S.A., p. 97.
1901. Odontostomia deplexa, Tate and May. P.L.S. N.S.W., p. 383, pl. 25, f. 45.

Hab.—Flinders, Western Port.

ODOSTOMIA SUPRASCULPTA, T. Woods.

1877. Rissoina suprasculpta, T. Woods. P.R.S. Vic., p. 57.
1900. Odontostomia varians, Tate and May. T.R.S. S.A., p. 97.
1901. Odontostomia suprasculpta, Tate and May. P.L.S. N.S.W., p. 383, pl. 25, f. 53, and pl. 26, f. 68.

Hab.—Portsea, Port Phillip; dredged off Rhyll, Western Port.

Obs.—The type is in the National Museum.

ODOSTOMIA (PYRGULINA) MAYII, Tate, var.

1898. Odontostomia (Pyrgulina), mayii. Tate. T.R.S. S.A., vol. xxii., p. 84. pl. 4. f. 6.
1902. Odontostomia (Pyrgulina) mayii. Tate and May. P.L.S.N.S.W., vol. xxvi., p. 383.

Hab.—Portsea, Port Phillip.

Obs.—Our shells are rather smaller than the type, and the base differs, otherwise they agree fairly well with the description and figure, so at present we regard it as a variety.

Genus **Oscilla,** A. Adams, 1867.

OSCILLA LIGATA, Angas.

1877. Oscilla ligata. Angas. P.Z.S. Lond., p. 173, pl. 26, f. 11.
1877. Parthenia tasmanica, T. Woods. P.R.S. Tas., p. 150

Hab.—Portsea, Port Phillip; San Remo, and dredged off Rhyll, Western Port.

Genus **Pseudorissoina,** Tate and May, 1900.

PSEUDORISSOINA TASMANICA, T. Woods.

1877. Stylifer tasmanica, T. Woods. P.R.S. Tas., p. 152.
1899. Rissoia tasmanica, Tate. T.R.S. S.A., p. 233.
1900. Pseudorissoina tasmanica, Tate and May. T.R.S. S.A., p. 98.
1901. Pseudorissoina tasmanica, Tate and May. P.L.S. N.S.W., p. 384, pl. 25, f. 55, 56.

Hab.—Portsea, Port Phillip; Flinders and San Remo, Western Port.

BITTIUM MINIMUM, T. Woods.

See part IV., p. 155.

1878. Bittium minimum, T. Woods. P.R.S. Tas., p. 123.
1879. Bittium minimum, T. Woods. Id., p. 35.

1901. Bittium minimum, Hedley. P.L.S. N.S.W., p. 722, fig. 20, in text.

1901. Cerithiopsis minima, Tate and May. Id., p. 385.

Hab.—Western Port; Port Phillip.

Cerithiopsis semilaevis, T. Woods.

1877. Bittium semilaevis, T. Woods. P.R.S. Vic., p. 58.

Hab.—San Remo, Western Port.

Obs.—The type is in the National Museum.

Genus **Seila,** A. Adams, 1861.

Seila attenuta, Hedley.

1900.—Seila attenuata, Hedley. P.L.S. N.S.W., p. 91, pl. 3, f. 9, 9a.

Hab.—Ocean Beach, Point Nepean.

Obs.—When describing this species Mr. Hedley remarks that it is the first record of this genus occurring in Australia.

Triphora granifera, Brazier.

1894. Triforis graniferus, Brazier. P.L.S. N.S.W., p. 173, pl. 19, f. 10.

1903. Triphora granifera, Hedley. Id., p. 610, pl. 33, f. 28, 29.

Hab.—Flinders, Western Port.

Triphora labiata, A. Adams.

1851. Triphoris labiatus, A. Adams. P.Z.S. Lond., p. 279.

1867. Triphoris labiatus, Angas. Id., p. 209, No. 138.

1903. Triphora labiata, Hedley. P.L.S. N.S.W., p. 617, pl. 33, f. 42-44.

Hab.—Shoreham, Western Port.

TRIPHORA CINEREA, Hedley.

1903. Triphora cinerea, Hedley. P.L.S. N.S.W., p. 612, pl. 33, f. 36, 37.

Hab.—Dredged off Rhyll, Western Port.

TRIPHORA MACULOSA, Hedley.

1903. Triphora maculosa, Hedley. P.L.S. N.S.W., p. 614, pl. 32, f. 32, 33.

Hab.—Flinders, Shoreham, and San Remo, Western Port.

Obs.—Mr. Hedley, in the paper above quoted, states that this is the same shell as that known as of A. Adams, under the same name, but the latter never described it, and it was only a list name. He also gives reasons for the adoption of the generic name of Triphora instead of Triforis.

DIALA PICTA, A. Adams.

1861. Diala picta, A. Adams. A.M.N.H., p. 243, and 1862, p. 295.

Hab.—San Remo, Western Port.

Genus **Styliferina,** A. Adams, 1860.

STYLIFERINA, sp.

Hab.—Dredged off Phillip Island, Western Port, about 7 fathoms.

Genus **Callomphala,** Adams and Angas, 1864.

CALLOMPHALA LUCIDA, Adams and Angas.

1864 Neritula (Callomphala) lucida, Adams and Angas. P.Z.S. Lond., p. 35, No. 3.

1899. Teinostoma lucida, Hedley. P.L.S. N.S.W., p. 433, f. 5 (3 in text).

Hab.—Ocean Beach, Point Nepean.

CYCLOSTREMA INSCRIPTUM, Tate.

1899. Cyclostrema inscriptum, Tate. T.R.S. S.A., p. 216, pl. 7, f. 3a, 3b.

Hab.—Portsea, Port Phillip.

CYCLOSTREMA JOHNSTONI, Beddome.

1883. Cyclostrema johnstoni, Beddome. P.R.S. Tas., p. 168.

1899. Cyclostrema johnstoni, Tate. T.R.S. S.A.. p. 215, pl. 7, f. 7a, 7b.

Hab.—Dredged off Rhyll, Western Port.

CYCLOSTREMA PORCELLANA, Tate and May.

1900. Cyclostrema porcellana, Tate and May. T.R.S. S.A. p. 101.

1901. Cyclostrema porcellana, Tate and May. P.L.S. N.S.W., p. 397, pl. 27, f. 93.

Hab.—Flinders, Western Port.

CYCLOSTREMA ANGELI, T. Woods.

See part V., p. 100.

1900. Cyclostrema angeli, Hedley. P.L.S. N.S.W., p. 503, pl. 25, f. 14.

Hab.—Western Port.

LODDERIA MINIMA, T. Woods.

See part V., p. 101.

1879. Liotia minima, Petterd. Jour. of Conch., vol. ii., p. 88, No. 11.

1900. Lodderia minima, Hedley. P.L.S. N.S.W., p. 94, pl. 3, f. 1-3.

Hab.—Brighton, Port Phillip; Western Port.

Obs.—In Petterd's paper above cited he gives Long Bay, Tasmania, as the locality, seemingly of the type, but the type specimen is, as we have stated, in the National Museum, Melbourne, and the locality given is Brighton. Hedley has since obtained it in Sydney Harbour and in his paper above quoted gives a fuller description of it.

RISSOA AGNEWI, T. Woods.

1877. Rissoa agnewi, T. Woods. P.R.S. Tas., p. 152.
1901. Rissoia agnewi, Tate and May. P.L.S. N.S.W., p. 392, pl. 26, f. 70 (this f. is R. layardi Petterd).
1903. Rissoa agnewi, May. P.R.S. Tas., p. 112, f. 10.

Hab.—Portsea, Port Phillip.

Obs.—Mr. May in the article last quoted states that the fig. No. 70 above referred to represents another species, namely, R. layardi, Petterd.

RISSOA DUBITABILIS, Tate.

1884. Rissoa dubia, Petterd. Jour. of Conch., p. 37 (non Defrance).
1899. Rissoia dubitabilis, Tate (nom. mut.). T.R.S. S.A., p. 232.
1901. Rissoia dubitabilis, Tate and May. P.L.S. N.S.W., p. 391, pl. 26, f. 71.

Hab.—Dredged off Rhyll, Western Port.

RISSOA WOODSI, Pritchard and Gatliff.

1901. Rissoa woodsi, Pritchard and Gatliff. P.R.S Vic., p. 104.
1903. Rissoa woodsi, May. P.R.S. Tas., p. 112, f. 9.

Hab.—Western Port; Port Phillip; Puebla

Obs.—In the paper last referred to, Mr. May agrees with us that it is a distinct species, and gives a figure of it.

RISSOA FLAMMEA, Frauenfeld.

1868. Sabanaea flammea, Frauenfeld. Novara, vol. vi., p. 12, pl. 2, f. 18.
1887. Rissoia (Sabanaea) flammea, Tryon. Man. Conch., vol. ix., p. 339, pl. 63, f. 64.

Hab.—Portsea, Port Phillip.

RISSOA PELLUCIDA, Tate and May.

1900. Rissoia (Nodulus) pellucida, Tate and May. T.R.S. S.A., p. 100.

1901. Rissoia pellucida. Tate and May. P.L.S. N.S.W., p. 394, pl. 23, f. 8.

Hab.—Anglesea (T. S. Hall).

Genus **Rissopsis,** Garrett, 1873.

RISSOPSIS MACCOYI, T. Woods.

1877. Rissoa (Ceratia) maccoyi, T. Woods. P.R.S., Tas., p. 154.

1900. Rissoa maccoyi, Hedley. P.L.S. N.S.W., p. 505, pl. 26, f. 11.

1901. Rissopsis maccoyi, Tate and May. Id., p. 394.

Hab.—Flinders, Western Port.

Obs.—The shell somewhat resembles a Truncatella, but may be distinguished from that genus by its spiral sculpture.

LEPTOTHYRA ARENACEA, Pritchard and Gatliff.

See part v., p. 117. Leptothyra, n. sp.

1902. Leptothyra arenacea, Pritchard and Gatliff. P.R.S. Vic., vol. xiv. (n.s.), part 2, p. 181, pl. 9, f. 3.

Hab.—Dredged off Phillip Island, Western Port.

ASTRALIUM FIMBRIATUM, Lamarck.

See part v., p. 117.

1822. Trochus fimbriatus, Lamarck. Anim. S. Vert., vol. vii., p. 12, No. 8.

1844. Trochus squamiferus, Koch. Abbild und Besch, neuer Conch., pl. 4, f. 9.

Hab.—Cape Schanck; Warrnambool. Dredged off Phillip Island, Western Port.

Obs.—Since we previously listed this shell we have obtained the date on which Koch described it, and find that Lamarck's name has priority.

PHASIANOTROCHUS CARINATUS, Perry.

1811. Bulimus carinatus, Perry. Conch., pl. 30, f. 1.
1811. Bulimus eximius, Perry. Id., f. 2.
1902. Phasianotrochus rosea, Pritchard and Gatliff. P.R.S., Vic., vol. xix., p. 125.

Hab.—Western Port, etc.

Obs.—Our species is undoubtedly the same as that figured by Perry.

CALLIOSTOMA HEDLEYI, Pritchard and Gatliff.

See part v., p. 136. Calliostoma, n. sp.

1902. Calliostoma hedleyi, Pritchard and Gatliff. P.R.S. Vic., vol. xiv., part 2, p. 182, pl. 9, f. 4.

Hab.—Western Port, etc.

SCHISMOPE BEDDOMEI, Petterd.

See part vi., p. 181.

1901. Schismope beddomei, Tate and May. P.L.S. N.S.W., p. 407, pl. 24, f. 24.

Hab.—Western Port.

Obs.—This shell is figured for the first time as above quoted.

SCHISMOPE PULCHRA, Petterd.

See part vi., p. 182.

1901. Schismope pulchra, Hedley. P.L.S. N.S.W., p. 726, f. 25.

Hab.—Western Port.

Obs.—Mr. Hedley in the text as above referred to gives a figure of this ornate little species, the dimensions of which are: Diameter, 2 mm.; height, 1 mm.

ACMAEA OCTORADIATA, Hutton.

1873. Patella octoradiata, Hutton. Cat. N.Z., Moll., p. 44.

1903. Patella perplexa, Pritchard and Gatliff. P.R.S. Vic., vol. xv., p. 194.
1904. Acmaea octoradiata, Hedley. P.L.S. N.S.W., p. 188.

Hab.—Port Phillip.

Obs.—Prof. Hutton did not include this species in his Manual, as he doubted whether it was found in New Zealand, but it has recently been obtained there.

Genus **Callistochiton**, Carpenter.

CALLISTOCHITON ANTIQUUS, Reeve.

1847. Chiton antiquus, Reeve. Conch. Icon., vol. iv., pl. 35, sp. 169.
1892. Callistochiton antiquus, Pilsbry. Man. Conch., vol. xiv., p. 274, pl. 59, f. 29-35.
1897. Callistochiton antiquus, Bednall. P. Mal., Soc., vol. ii., p. 150.

Hab.—Port Fairy (Rev. J. Whan); Shoreham.

CHITON CALLIOZONA, Pilsbry.

1894. Chiton (aereus, var.) calliozona, Pilsbry. Nautilus, vol. viii., p. 55.
1897. Chiton calliozona, Bednall. P. Mal. S. Lond., vol. ii., p. 151, figure in text and pl 12, f. 6 a, b, c, d.

Hab.—Obtained within the mouth of the empty shell of a Volute, got off Cape Schanck (R. A. Bastow).

CYLINDROBULLA FISCHERI, Adams and Angas.

See part vi., p. 217.

1903. Cylindrobulla fischeri, Hedley. P.L.S. N.S.W. p. 604, pl. 29, f. 8, 9.

Obs.—This shell is figured for the first time as above quoted.

MACTRA PURA, Deshayes.

See part vii., pp. 105, 106.

Obs.—Actual Victorian specimens of this species have been compared with Deshayes type in the British Museum by Mr. E. A. Smith and one of us, and there is no doubt whatever about their identity.

TELLINA KENYONIANA, Pritchard and Gatliff.

See part vii., p. 118. Tellina, n. sp.

1904. Tellina kenyoniana, Pritchard and Gatliff. P.R.S. Vic., vol. xvii., n.s., pt. 1, p. 339, pl. 20, f. 1-4.

Hab.—Type from Airey's Inlet, odd valves from Rye to Portsea, Port Phillip.

CHIONE NITIDA, Quoy and Gaimard.

1835. Venus nitida, Quoy and Gaimard. Astrolabe, Zool, vol. iii., p. 529, pl. 84, f. 13, 15 (in the text the figures are wrongly given as 13, 14).

1903. Chione fumigata, Pritchard and Gatliff. P.R.S. Vic., vol. xvi., p. 123.

1904. Chione nitida, Hedley. P.L.S. N.S.W., p. 194.

Obs.—We are quite in agreement with Mr. Hedley in his treatment of this species, and the fact of its having been previously overlooked is easily understood, now that he has called attention to the wrong numbering of the figures, and the shell is depicted in such a way as to lead one to consider it as being concentrically ridged, whereas it is concentrically banded, and specimens thus coloured are rarely met with here, as the radial colouration is usually more conspicuous, and frequently all dark markings are absent or only discernible about umbones.

LUCINA MINIMA, T. Woods.

See part vii., p. 138, and p. 139.

1892. Lucina perobliqua, Tate. T.R.S. S.A., vol. xv., pt. 2, p. 128, pl. 1, f. 10.

1903. Lucina minima, May. P.R.S. Tas., p. 114, f. 12.

Hab.—Portsea, Port Phillip; Ocean Beach, Point Nepean.

Obs.—In the last reference given, Mr. May states that there are two species mounted on the card, one of which he figures as being the type, according to description, of T. Woods' species, and the other one he considers to be L. tatei, Angas. Tate and May in their Tasmanian Census united L. minima, and L. tatei. The former species had not then been figured. We now agree with Mr. May in considering them distinct, but they are very similar. May figures a small form, and Tate a very large one.

LUCINA TATEI, Angas.

1878. Lucina tatei, Angas. P.Z.S. Lond., p. 863, pl. 44, f. 15.

Hab.—Coast generally.

Obs.—The sculpture in this species is somewhat coarser than that of L. minima, more especially so in the radial ornament.

Genus **Erycina**, Lamarck, 1804.

ERYCINA ACUPUNCTA, Hedley.

1902. Erycina acupuncta, Hedley. Mem. Aust. Mus., vol. iv., part 5, p. 321, f. 60.

Hab.—Dredged in about 7 fathoms, Western Port, off Phillip Island.

GLYCIMERIS STRIATULARIS, Lamarck.

See part viii., p. 244.

Obs.—In our previous treatment of this species we included P. holosericus, Reeve, as a synonym, based upon the figure and descriptions available to us. In our present examination of specimens from New South Wales of P. holosericus, we note a divergence in the minute details of sculpture, from our ordinary forms of G. striatularis, which, if constant throughout a series, might be utilised for specific distinction.

MYTILUS EROSUS, Lamarck.

1819. Mytilus erosus, Lamarck. Anim. S. Vert., vol. vi., p. 120.

1904. Mytilus polyodontus, Pritchard and Gatliff. P.R.S. Vic., vol. xvii., pt. 2, p. 248.

1904. Mytilus erosus, Hedley. P.L.S. N.S.W., vol. xxix., pt. 1, p. 200.

Obs.—In part viii. of our catalogue above quoted, we refer to the type of M. polyodontus as being in the British Museum collection; these remarks should have been specified as applying to M. menkeanus, Reeve.

Genus **Philippiella**, Pfeiffer, 1886.

PHILIPPIELLA RUBRA, Hedley.

1904. Philippiella rubra, Hedley. P.L.S. N.S.W., p. 207, pl. 10, f. 44-47.

Hab.—Dredged about 7 fathoms Western Port, off Phillip Island; Portsea, Port Phillip; Torquay.

PHILIPPIELLA CRENATULIFERA, Tate.

See part viii., p. 255.

1904. Philippiella crenatulifera, Hedley. P.L.S. N.S.W., p. 208.

Obs.—As the peculiar protoconch of Philobrya is absent in the above shell, Mr. Hedley suggests that it is advisable to place it temporarily as a Philippiella.

INDEX TO GENERA AND SPECIES.

To the respective generic and specific names reference is given to the volume of the Proc. Royal Soc. of Victoria in which it appears, and the page or pages at which they will be found, but for further simplification full particulars of the different parts published are here appended.

Part I., P.R.S. Vic., vol. x. (n.s.), pt. 2, May, 1898, pp. 236–284.
,, II., ,, ,, vol. xi. (n.s.), pt. 2, Feb., 1899, pp. 185–208.
,, III., ,, ,, vol. xii. (n.s.), pt. 2, April, 1900, pp. 170–204.
,, IV., ,, ,, vol. xiii. (n.s.), pt. 1, Aug. 1900, pp. 139–156.
,, V., ,, ,, vol. xiv. (n.s.), pt. 2, April, 1902, pp. 85–138.
,, VI., ,, ,, vol. xv. (n.s.), pt. 2, Feb., 1903, pp. 176–223.
,, VII., ,, ,, vol. xvi. (n.s.), pt. 1, Sept., 1903, pp. 96–139.
,, VIII., ,, ,, vol. xvii. (n.s), pt. 1, Sept. 1904, pp. 220–266.

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ART. VII.—*New or Little-known Victorian Fossils in the National Museum, Melbourne.*

PART VII.—A NEW CEPHALASPID, FROM THE SILURIAN OF WOMBAT CREEK.

BY FREDERICK CHAPMAN, A.L.S., &c.,

National Museum.

(With Plates VII., VIII.).

[Read 14th December, 1905].

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INTRODUCTORY REMARKS.

The subject of the following notes was included in a series of fossils collected by W. H. Ferguson from Wombat Creek, and submitted to Sir Fredk. McCoy for determination by the Mines Department, Melbourne, about April, 1894.[1] The occurrence of this fish is of very great interest, not only on account of its being the oldest recorded vertebrate from Australia, but also that it represents a species of the genus Thyestes, which is by far the largest yet described. The genus Thyestes (=Auchenaspis, Egerton) has, up to the present, been characterized by small-sized species as compared with the fishes belonging to the allied genus Cephalaspis. The specimen now before us vies, in point of size, with the majority of the species of the last-named genus.

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[1] I have been unable to find any notes or comments with these specimens.

DESCRIPTION.

Family CEPHALASPIDÆ.

Genus *Thyestes*, Eichwald.

Thyestes magnificus, sp. nov.

Specific Characters.—The remains of this fish available for description consist of more than two-thirds of the dorsal surface of the head shield, together with two and part of a third series of Dorso-lateral plates, which are fused to the shield posteriorly. The fossil is preserved in a limonitic mudstone, and apparently the external layer of the shield and posterior plates is partially dissolved away; but, in spite of this, the surface tuberculations are represented in strong relief. The Cornua are wanting, but there are indications on the matrix that they were incurved and comparatively short.

Head Shield truncately rounded in front and narrower in that region than is usual in the genus. Sides gently rounded and sloping outwards, having a shallow inflection near the middle of the lateral margins. Border of head shield formed by a strong rim, rounded dorsally, whilst just within, on the anterior and antero-lateral margins, lies a series of short, parallel, oblique bars (borders of the marginal cells), cut off by an inner border, bounded in turn by a series of tubercles. The inner border of the head shield leaves the lateral margins at a distance of about 13mm. from the middle of the anterior rim, curving sharply backwards to meet the inter-orbital ridge.

Surface of Shield (Dorsal), originally more or less convex, but now irregular through distortion and slight crushing on the right lateral side; covered with numerous somewhat large tubercles, each seated in a depressed area, usually hexagonal, the sides of which appear to be finely and radiately striate, as in certain figured specimens of Cephalaspis lyelli.[1] The hexagonal tesselation of the shield is best seen in our specimen towards the left posterior angle.

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[1] cf. Agassiz. Poiss. Foss., vol. ii., pl. 1*b*, figs. 1,2.

It is probable that the tubercles are brought out in stronger relief by the removal of part of the external layer of the shield. Occasionally the tubercles are hollow at their summits, a character likewise observed in certain species of Cephalaspis.[1] A more or less divergent and quincuncial arrangement is observable with regard to the tubercles, and they appear to radiate from near the base of the head shield. There is an obscure areolation of the surface of the shield, due to numerous sinuous ridge-like lines; each areola enclosing several tubercles. The margins of the post-orbital plate are distinctly seen, as well as the inter-obital ridge; the latter is tuberculated on the lateral slopes, rough on the summit, and crenate in front. Position of eyes apparently indicated by a pair of elliptical depressions, situated near the base of the inter-orbital ridge, at a distance of about $\frac{1}{3}$ the length of the shield, measured from the front.

Dorso-lateral scales.—In the known species of Thyestes the fused posterior body scales seem to have been confined to a single series. In our specimen there appear to be some indications of longitudinal junction lines, separating a dorsal and lateral series, but the evidence for such is not so clear as to allow one to speak positively. The lateral edges of the posterior scales extend almost to the base of the cornua.

The surface ornamentation of the dorso-lateral scales is similar to that on the head shield but finer, the tubercles being about $\frac{2}{3}$ the diameter of those on the head shield. The margins of the dorso-lateral scales are strongly scalloped, and in the present specimen do not extend backward so far along the median dorsal ridge as in Thyestes verrucosus, Eichwald.[2]

Dimensions (Approximate, on account of some distortion):—

Length of Head Shield along median line, from anterior rim to the crista occipitalis - - -	39mm.
Width of Head Shield, measured from the widest part at the base of the cornua - - - -	88mm.
Distance of the orbits from the anterior rim of the Head Shield, about - - - - - -	16mm.

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[1] See "Fishes of the Old Red Sandstone," Powrie and Lankester. Pal. Soc. Mon., vol. xxiii., 1870, p. 55, pl. xiii., fig 19a (C. lightbodii).

[2] See Rohon, J. V., "Die obersilurischen Fische von Oesel I." Mem. Acad. Imp. Sci., St. Petersburg, ser. 7, vol. xxxviii., 1892, pl. 1.

Approximate length of Post-orbital Valley - -	18mm.
Greatest longitudinal extent of series of Dorso-lateral scales represented in this specimen - - -	14mm.
Average diameter of tubercles on Head Shield - -	1.5mm.
Average diameter of tubercles on Dorso-lateral scales	1mm.

Affinities.—The present species shows certain affinities to the three known species of Thyestes, viz., T. verrucosus, Eichwald ; T. egertoni, Powrie and Lankester sp.,[1] and T. salteri, Egerton, sp.[2] The outline of the head shield, however, is not so long, proportionally, in any of the above-named species, our specimen being more decidedly narrowed in front.

The forward position of the occipital crest corresponds most nearly with that in T. egertoni and T. salteri, T. verrucosus having the crest prolonged far behind the points of the cornua. As regards the post-orbital fossa, the border of its plate in T. magnificus is regularly pyriform or Florence-flask shaped, rather than elongately triangular, as in the restored figure of T. verrucosus given by Rohon,[3] whilst in T. egertoni it is apparently elliptical.

Although our specimen is not sufficiently well preserved to allow one to speak of the actual form of the cornua, the base of the left cornu is so shaped that it seems probable, similarly with T. salteri, they were more prolonged than in T. verrucosus, and recurved towards the body as in T. egertoni, but were not so slender. The tubercles of the head shield are of a uniform size in our species; whilst they are variable in T. verrucosus, and comprise both large and small.

The characters which help to confirm the above described species as belonging to the genus Thyestes are :—

1. The presence of fused posterior dorso-lateral scales.
2. The general form and outline of the head shield.
3. The coarsely tuberculated surface of the head shield, and posterior body scales, comparable to some extent with that of Thyestes verrucosus.

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[1] (Auchenaspis egertoni). "Fishes of the Old Red Sandstone." Pal. Soc. Mon., 1870, p. 57, pl. xiii., figs. 3-5 ; woodcut 30.

[2] (Auchenaspis salteri), Egerton. Quart. Journ. Geol. Soc., vol. xiii., 1857, p. 286, pl. ix.

[3] Op. cit., pl. 1, fig. 1.

Whilst showing certain characteristics in common with T. verrucosus, T. egertoni, and T. salteri, the species now named T. magnificus differs in the wide, laterally extended, fused posterior elements of the body-covering; in the extremely pronounced tubercular ornament, and the sometimes hollow or perforate character of the tubercles; and in the extraordinarily large size of the head-shield as compared with all known examples of Thyestes. The width ratio of T. magnificus is as 2:1 in comparison with the measurements of a specimen of T. verrucosus given by Rohon[1], and as 4:1 compared with a specimen of T. egertoni in the collection of the National Museum.

Occurrence.—This interesting and unique specimen was found in the Silurian (Yeringian) mudstones of Wombat Creek, a tributary of the Mitta Mitta River, N.E. Gippsland.

At this locality the Silurian rocks rest unconformably on the Upper Ordovician slates and sandstones, the slates of the latter group containing Climacograptus bicornis, J. Hall, var. longispina, T. S. Hall; Dicellograptus elegans, Carruthers; and D. cf. morrisi, Hopk.

The downward succession of these beds, resting on Ordovician strata, is as follows[2]:—

4 Shales and fine-grained sandstone, very fossiliferous—with Trilobites, Crinoids, Corals and Brachiopods. (This bed in all probability yielded the fish remains[3]).

3 Limestone—with Corals and Crinoids.

2 Thin bed of sandstone, with few fossils—Trilobites, Crinoids, Corals, and Brachiopods.

1 Breccia and conglomerate—with internal casts of Atrypa reticularis.

From the general facies of the fossiliferous Silurian rocks exposed at Wombat Creek, it is highly probable that the several beds may all be included in the uppermost or Yeringian series.

A noteworthy feature, in common with similar Silurian rocks of other localities, where the junction of the Silurian and Upper Ordovician can be seen, is the absence of the lower, Melbournian, division; the rocks overlying the Ordovician being apparently in all cases referable to the Yeringian. This affords us unmistakable proof of a remarkable overlap of the upper division of the Silurian system in Victoria, the more extensive development of the upper beds being a consequence of the gentle subsidence of the lower or Melbournian rocks during the deposition of the Yeringian mud, sands and shelly accumulations in the sea which covered central and eastern Victoria during the later Silurian period.

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[1] Op. supra cit.

[2] See Ferguson, W. H. Monthly Progress Report, No. 3, 1889, p. 17.

[3] Mr. Ferguson has since confirmed this opinion.

The uppermost beds of the Yeringian series occurring at Lilydale, in the Upper Yarra, near Mount Matlock and at Wombat Creek, contain a few genera (as Panenka, Hercynella[1] and Styliola) which are elsewhere more typical of the rocks of Lower Devonian age, as, for example, the Lower Helderberg series of North America. In regard to the latter, it is somewhat significant that, whilst the European geologists place the L. Helderbergian in the Lower Devonian, the American geologists consider them, together with the Oriskany Sandstone, as the topmost beds of the Silurian, on account of their containing a large percentage of typical Silurian fossils. Our Yeringian beds in Victoria seem to furnish a parallel case, for, although the small admixture of Devonian forms has inclined some geologists to denominate them as Siluro-Devonian, their general facies shows them undoubtedly to belong to the highest beds of the Silurian. A systematic examination of the Yeringian bivalves, which the writer hopes to publish shortly, furnishes further support to the above conclusion.

Judging by the general aspect of the fossils at Wombat Creek, the mudstones of Bed 4 are probably equivalent in part to the Ludlow beds of Shropshire, the Upper Oesel Group in Russia, and the Waterlime Group (and, possibly, the L. Helderberg series) in North America; whilst the limestone of Bed 3, including the thick limestone bed at Cave Hill, Lilydale, and the lenticular masses of limestone on the Thomson River, contain a facies which reminds one of the Wenlock Group in England and Scandinavia, and of the Niagara Group of North America. In the present imperfect state of our knowledge of the rich Victorian Lower Palaeozoic fauna, it is impossible, however, to draw any close comparisons between similar faunas elsewhere; but when this lack of knowledge is supplied, the deductions to be drawn from the data thus afforded, promise, undoubtedly, to be full of interest and value to the stratigraphist.

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[1] This genus also occurs in the Silurian in the Bohemian basin, but is typically Devonian.

Associated Fossils at Wombat Creek.—Determinations of a series of fossils from Wombat Creek have already been made by Mr. R. Etheridge, junr., who recorded the following forms[1] :—

Petraia, sp.; Cystiphyllum (probably); a Cyathophylloid coral; Favosites; Pleurodictyum; Alveolites; Heliolites; Plasmopora sp. nov.; (?) Lingula; Leptaena; Strophomena; Orthis; (?) Pentamerus; Rhynchonella decemplicata; Atrypa reticularis; Cromus murchisoni, de Kon.; Phacops.

From the material collected at Wombat Creek, sent to Prof. McCoy, at the National Museum, I have myself made the following determinations of Yeringian fossils:—Receptaculites fergusoni, Chapm.; Amplexus sp.; Favosites sp. nov.; Encrinurus punctatus, Brünnich, sp.; E. murchisoni, de Kon. sp.; Rhombopora sp. nov.; Chonetes cresswelli, Chapm.; C. striatella, Dalman sp.; (?) Stropheodonta sp.; Orthis testudinaria, Dalman; Atrypa reticularis, Linn. sp.; Atrypina imbricata, Sow. sp.; Spirifer plicatellus, Linn. sp.; (?) Spirifer sulcatus, Hisinger sp.; Cyphaspis sp. nov.; Thyestes magnificus, sp. nov.

EXPLANATION OF PLATES.

PLATE VII.

Thyestes magnificus, sp. nov.

Part of Head-Shield and Dorso-lateral scales. Surface of fossil somewhat decorticated. In Silurian (Yeringian) mudstone, Wombat Creek, N.E. Gippsland. Natural size.

PLATE VIII.

Fig. 1.—Restoration (diagrammatic) of Thyestes magnificus, sp. nov. Explanation of lettering:—*a.r.*: antorbital ridge; *c.o.:* occipital crest; *d.s.:* dorso-lateral scales; *m.c.:* marginal cells; *o.:* probable position of orbit; *o.s.:* occipital spine; *p.c.:* posterior cornu; *p.o.v.:* post-orbital valley; *r.:* rim.

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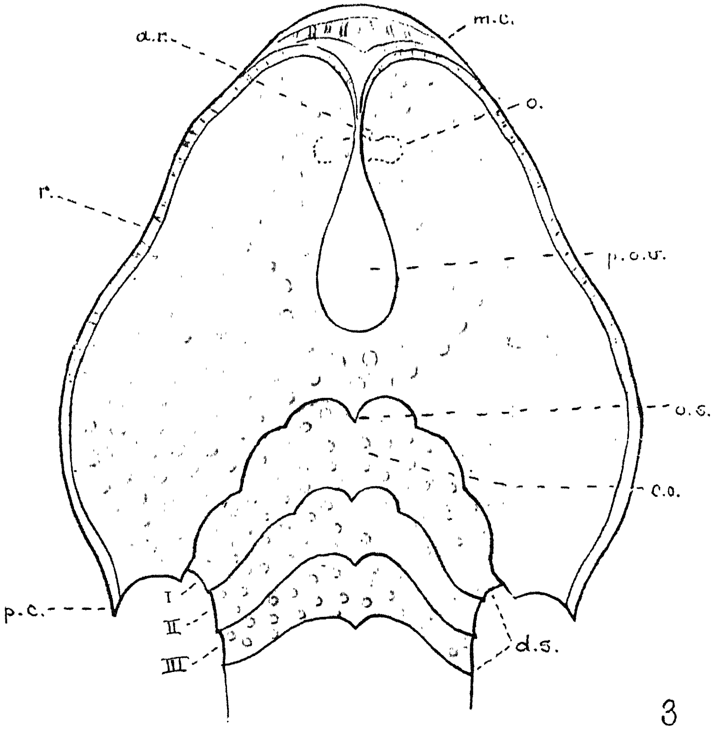
[1] Prog. Rep., vol. x., 1899, pp. 100, 101.

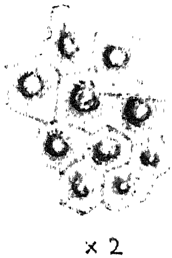
Fig. 2.—T. magnificus, sp. nov. Hexagonal markings of Head-shield, surrounding tubercles; seen on left posterior region of shield. × 2.

,, 3.—T. magnificus, sp. nov. Portion of the left anterior margin of shield, above the rounded lobe; showing the form of the marginal cells. × 2.

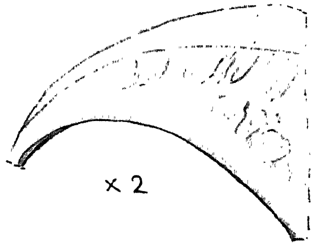
1



2



3



ANNUAL REPORT OF THE COUNCIL

FOR THE YEAR 1904.

The Council of the Royal Society herewith presents to the Members of the Society the Annual Report and Statement of Receipts and Expenditure for the year 1904.

Meetings were held as follows:

March 10.—Annual Meeting and Election of Officers. Ordinary Meeting. *Exhibits:* 1. Moa Feathers, by Professor W. Baldwin Spencer. 2. Some curiously-grown shells and casts of shells in gypsum, by F. Chapman—on behalf of the Trustees of the National Museum. 3. Spinthariscope, by Professor W. C. Kernot.

April 21—Special Meeting in conjunction with the Field Naturalists' Club, at which the Mueller Medal, awarded by the Australasian Association, was formally handed over to Mr. A. W. Howitt.

May 12.—*Papers:* 1. "Contributions to our knowledge of the Anatomy of Notoryctes typhlops," by Dr. Georgina Sweet. 2. "Relations of the Granite and Silurian Rocks of Dandenong," by J. M. Sutherland. *Exhibits:* Two rare Birds of Paradise, Pteridophora alberti and Aslaphia nigra (male), by J. A. Kershaw —for Trustees of National Museum.

June 9—*Papers:* 1. "The Alternate Current Transformer," by Professor T. R. Lyle. 2. "Revision of the Australian Aphodiides," by Rev. T. Blackburn. 3. "Tabulated List of the Fossil Cheilostomatous Polyzoa in the Victorian Tertiary Deposits," by C. M. Maplestone. 4. "The Antiquity of Man in Victoria," by Professor J. W. Gregory.

July 14.—*Papers:* 1. Catalogue of the Marine Shells of Victoria, Part 8," by G. B. Pritchard and J. H. Gatliff. 2. "Contributions to the Palaeontology of the Older Tertiaries of Victoria—Gastropoda, Part 2," by G. B. Pritchard. 3. "Tertiary Fish of Australia, Part 1," by F. Chapman and G. B.

Pritchard. 4. "New or Little-known Victorian Fossils in the National Museum, Melbourne, Part 4—Some Silurian Ostracoda and Phyllopoda," by F. Chapman. 5. "Description of Some New Victorian Mollusca," by G. B. Pritchard and J. H. Gatliff.

August 11.—*Paper:* "The Mount Morgan Goldfield," by E. J. Dunn. *Exhibits:* 1. Sections of Wood showing Drought Registering, by E. J. Dunn. 2. Fibre-balls from Middleton Beach, near Goolwa, South Australia, by J. A. Kershaw—for the Trustees of the National Museum. 3. Spear Throwers from Cape York and German New Guinea, by H. R. Walcott—for the Trustees of the Museum. 4. Palaeospondylus gunni, by F. Chapman—for the Trustees of the Museum.

September 8.—*Paper:* "A Crab from the Victorian Tertiaries (Ommatocarcinus corioensis, Cresswell, sp.), by T. S. Hall. *Exhibits:* 1. Skull of Gilbert Islander, cut by bamboo knife; also Bamboo Knife from New Guinea, by Professor W. Baldwin Spencer. 2. Skull of adult Female Australian Aboriginal from the Geelong district with clear frontal suture, by Professor W. Baldwin Spencer. 3. Teeth and symphysis of lower jaw of Diprotodon australis from Lake Calvert, by Biological Department of University. 4. Specimens in illustration of his paper, by T. S. Hall.

October 13.—*Papers*: 1. "On Nepharis and other Ant's-nest Beetles, taken by J. G. Goudie, at Birchip," by A. M. Lea. 2. "Note on the Stony Creek Basin, Daylesford," by T. S. Hart. 3. "Account of the Separation and Identification of a Kaolin Incrustation on Pyrolusite, from Broken Hill," by G. S. Walpole.

November 10.—*Papers*: 1. "Polyzoa from Lord Howe Island," by C. M. Maplestone. 2. "Notes on the Older Tertiary Foraminiferal Rocks of Santo, New Hebrides," by F. Chapman (withdrawn). 3. "On the Occurrence of the Genus Cryptoplax in the Victorian Tertiaries," by T. S. Hall. *Exhibit*: "Volcanic Dust gathered from the deck of the 'Roddam,' Bay of S. Pierre, 8th May, 1902," by F. Chapman.

December 8.—Mr. G. Sweet delivered a Lecturette, entitled, "Recent Geological Changes in the Atoll of Funafuti," illustrated by Lantern Slides.

During the year two Members, one Country Member, and four Associates were elected, and two Members and one Associate resigned.

The "Proceedings" of the Society, New Series, Vol. XVI., Pt. 2, and Vol. XVII., Pt. I., were published during the year.

A deputation of the Council waited on the Chief Secretary during the year, to request an increase in the Annual Grant, but the Council was disappointed to find that no increase was made. The increased size of the volume has meant a larger expenditure, and our finances are consequently at a very low ebb. The sum which was originally specially collected as a Research and Publication Fund, has, during the past few years, become exhausted, and unless the Government come to our aid to assist us in publishing the results of the investigations of our members, our annual volume must be materially diminished in size, and a great deal of valuable matter will be lost. A further appeal will be made to the Government during the year, when it is hoped that the requisite amount will be granted.

During the year the Library was increased by the addition of 1112 volumes and parts. The binding is getting still further into arrears, and valuable publications, not found elsewhere in the State, are in danger of being destroyed.

It is desirable that the grounds and fencing should be put in better order, and the caretaker's cottage is also in urgent need of repairs, but the work is at present beyond our means.

The Honorary Treasurer in Account with the Royal Society of Victoria.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from 1903	£55	18	4	By Printing and Stationery	£247	17	7
Government Grant	50	0	0	Postages	25	10	7
Subscriptions—				Freight, Advertising and Sundries	4	17	11
Members	57	15	0	Salary of Assistant-Secretary	25	0	0
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Transfer from Publishing Fund ...	200	0	0	Furniture	1	8	6
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				Gas and Fuel	5	6	5
				Refreshments	6	2	9
					£358	11	9
				Balance	84	14	1
	£443	5	10		£443	5	10

Compared with the Vouchers and Bank Pass-Book, and found correct,

(Signed) P. DE JERSEY GRUT,
Hon. Treasurer.

(Signed) H. MOORS,
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7th March, 1905.

Royal Society of Victoria.

1905.

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1905.

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WITH THEIR YEAR OF JOINING.

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Officer, Sidney, Maryvale, Edenhope	1890
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Tipping, Isaac, C. E., Ballarat, Victoria	1892

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Woodward, J. H., Queen's Buildings, Rathdowne-street, Carlton	1903

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[PART II. ISSUED FEBRUARY, 1906].

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1906.

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[Proc. Roy. Soc. Victoria, 19 (N.S.), Pt. I., 1906].

Art. I.—*On some Victorian Marine Mollusca, New Species, and Others little-known.*

By J. H. GATLIFF.

(With Plates I. and II.).

[Read 10th May, 1906.]

The present paper contains descriptions and figures of the following species:—

Daphnella excavata, sp. nov.
Scala nepeanensis, sp. nov.
Scala translucida, sp. nov.
Cyclostrema bastowi, sp. nov.

Also figures of:—

Turricula tasmanica, T. Woods.
Cyclopecten nepeanensis, Pritchard and Gatliff.

Daphnella excavata, sp. nov. (Pl. I., Figs. 1 and 2).

Shell minute, thin, semi-transparent, of four-and-a-half whorls, the protoconch of one-and-a-half whorls appears to be smooth, but when examined with a one-and-a-half inch objective, under the microscope, it is densely spirally striate. The adult whorls are longitudinally costate, costae numbering eleven on the body whorl and extending to the shoulder where they slightly project over the suture, which is excavated. Spirally ridged, ridges becoming somewhat nodulous when crossing the costae. Sinus large and deep, lip sharp. Colour pale brownish-yellow.

Dimensions of type.—Length, 1.7 mm.; breadth, 1 mm.

Locality.—Portsea, Port Phillip, in shell sand.

Type in my collection.

Scala nepeanesis, sp. nov. (Pl. I., Fig. 5).

Shell minute, semi-translucent, apex of one-and-a-half smooth whorls, followed by three-and-a-half convex whorls, rapidly increasing in size, which are crossed by numerous erect ribs, numbering about sixteen on the penultimate whorl, with many equidistant spiral threads, causing aculeations where they cross the ribs. White. Suture impressed. Slightly umbilicated. Aperture circular.

Dimensions of Type.—Length, 1.5 mm.; breadth, .85 mm.

Locality.—Found in shell sand, Ocean Beach, Point Nepean.

Observations.—This small shell in form recalls S. lyrata, Sowerby.

Type in my collection.

Scala translucida, sp. nov. (Pl. I., Figs. 3 and 4).

Shell small, fairly solid, of eight convex whorls, apex blunt and rounded, protoconch of about one-and-a-half smooth whorls, ribs crossing the whorls are then gradually developed, on the penultimate whorl they number fifteen, and are strong and rounded; one or more of these is stouter than the others on the later whorls, probably marking stages of growth; the space between the ribs is densely spirally striate; the ribs do not extend across the whole of the body whorl, the base from the junction of the lip on the columella round to the centre of the outer lip being smooth, with the exception of a slight ridge crossing it and being a continuation of the stout rib; suture well-defined, aperture circular, lip thickened.

White, semi-translucent, with two very pale brown spots, one on the upper portion of the first rib, and the other on the eleventh rib.

Dimensions of Type.—Length, 5 mm.; breadth, 2 mm.

Locality.—Found in shell sand at Portsea, Port Phillip.

Observations.—The shell most closely approaching this hitherto recorded from our shores is S. (Acrilla) minutula, Tate and May. Mr. Hedley kindly compared it with S. morchi, Angas, and states that it is not that species. Sixteen other specimens were obtained immature. The type is somewhat worn, and a living shell might show the spiral striation on the ribs.

Type in my collection.

Cyclostrema bastowi, sp. nov. (Pl. II., Figs. 8-10).

Shell minute, discoidal; white. Spire sunken. Whorls four, suture linear. Rather widely and perspectively umbilicated. Upper surface: the periphery is roundedly carinate, and, under the lens, densely transversely striate; the carination starts from the protoconch and continues to the lip; inside of this carination is a raised continuous ridge of closely compacted spirally elongated granules. Side: bicarinate, with a flat groove between. Base: carinated similarly to the surface; inside the carination the closely compacted granules are more elongate and continue down the umbilicus. Outer lip thin.

Dimensions of type.—Greatest diameter, 0.9 mm.; height, 0.35 mm.

Locality.—Dredged in about 9 fathoms between Phillip and French Islands, Western Port.

Observations.—This little shell shows a very decided form of sculpture, and reminds one of a Solarium. I have much pleasure in naming it after Mr. R. A. Bastow, who has skilfully drawn it and the other species named in this paper.

Type in my collection.

Turricula tasmanica, T. Woods. (Pl. II., Figs. 6 and 7).

Referring to vol. xviii., p. 45, of these Proceedings, it is stated there that what was considered to be the typical form had not been found here. Since then whilst dredging in Western Port, between Phillip and French Islands, in about ten fathoms, Mr. C. J. Gabriel and I obtained four living and one dead shells, and upon submitting one to Mr. W. L. May of Tasmania, he informed me that he considered it to be the above species, but differing from the type in some minor details. As it does not quite agree with his figure of what he considers to be the type, a figure is now given of one of those we obtained, so that it may enable future collectors to identify it. The dimensions of the specimen figured are: length, 13; breadth, 5.5 mm.

Cyclopecten nepeanensis, Pritchard and Gatliff. (Pl. II., Fig. 11).

As the photographic figure given with the original description[1] is not altogether satisfactory, Mr. R. A. Bastow has kindly drawn the shell with the aid of the miscroscope, and the new figure well delineates the sculpture. The size of the shell now figured is 2.4 x 2 mm.

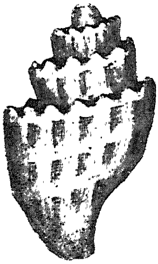
---

[1] Proc. Roy. Soc. Victoria, vol xvii. (new series), 1904, p. 338.

DESCRIPTION OF PLATES I., II.

Figs. 1, 2—Daphnella excavata, n. sp.
,, 3, 4—Scala translucida, n. sp.
,, 5—Scala nepeanensis, n. sp.
,, 6, 7—Turricula tasmanica, T. Woods.
,, 8-10—Cyclostrema bastowi, n. sp.
,, 11—Cyclopecten nepeanensis, Pritchard and Gatlift.

All figures variously magnified.



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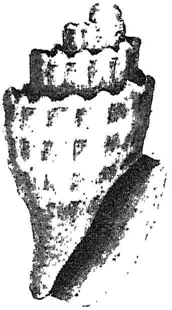

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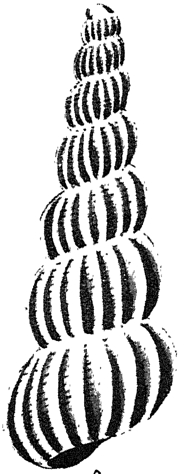

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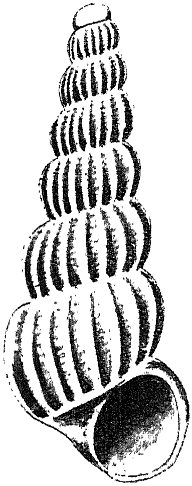

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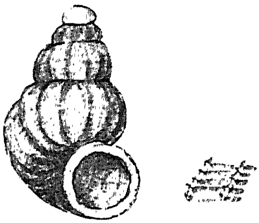

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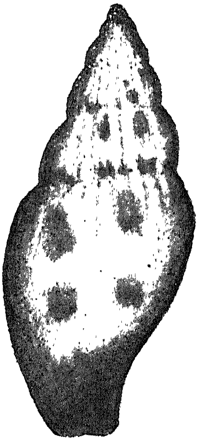
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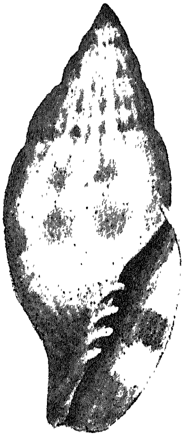
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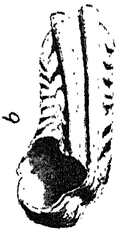
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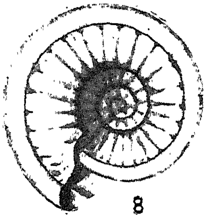
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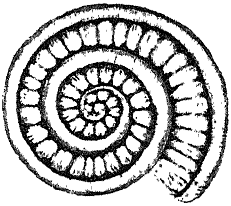
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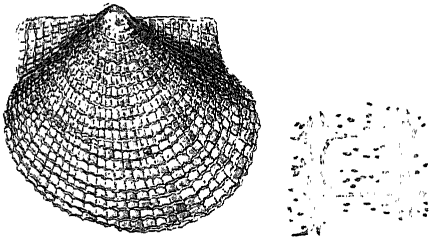
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[Proc. Roy. Soc. Victoria, 19 (N.S.), Pt. I., 1906].

Art. II.—*Some little known Victorian Decapod Crustacea, with Descriptions of New Species.—No. III.*

By S. W. FULTON and F. E. GRANT, F.L.S.

(With Plates III.-V.).

[Read 10th May, 1906.]

Two of the species dealt with in the present paper are new to science, one doubtfully so, as will be seen by the notes attached to it. One species is new to the Australian record and one is new to the Victorian census. The rest of the paper deals with the synonomy of some of our Victorian species.

Since reading our second paper of this series, our partnership has been much broken, owing to Mr. F. E. Grant having been transferred from Melbourne.

Mr. Grant recently paid a visit to London, and took the opportunity of examining the types and collections at the British Museum, where he received much courtesy and kindness, which he here desires to acknowledge. The knowledge thus gained has been of great service to us.

As much of the reference literature is difficult of access at this end of the world, we have quoted in extenso, for the convenience of future workers, the descriptions of genera and species not included in Haswell's Catalogue.

Suborder—BRACHYURA.

Tribe—Oxyrhyncha.

Family—*Maiidae.*

Sub-family—*Maiinae.*

Paramithrax (Chlorinoides) spatulifer, Haswell.

Haswell. Proc. Linn. Soc. N.S.W., vol. 6, 1882, p. 540.

Haswell. Cat. Aust. Crust., 1882, p. 14.

Chlorinoides coppingeri. Miers. "Challenger" Brachyura, 1886, p. 53, pl. 7, fig. 3 (nec Haswell).

A reference to the type of this species in the Australian Museum, Sydney, enables us to say that the form figured by

Miers (loc. cit.), whose specimen has also been examined by one of us, was incorrectly so identified by that author.

C. coppingeri was described from Port Molle, Q., and has since been taken by one of us near the Port Curtis, Q. This form appears to be confined to more tropical waters and is replaced in cooler latitudes by C. spatulifer. C. coppingeri, which has in consequence of Miers' incorrect figure, been more that once identified as occurring in Victoria must therefore now be removed from our list.

We may here draw attention to a discrepancy in Haswell's description of C. spatulifer in which he states that it has:—"Two long subacute spines on each branchial region, the anterior directed outwards, upwards and backwards," which should read: two long subacute spines on each branchial region directed outwards and upwards, the anterior forward and the posterior backward.

Leptomithrax australiensis. Miers.

L. australiensis, Miers. Ann. and Mag. Nat. Hist., 1875 (4), 27, p. 220.

L. spinulosus, Haswell. Proc. Linn. Soc. N.S.W., 1880, vol. 4, p. 441, pl. 25, fig. 3.

An examination of the types of the above—the first of which is in the British Museum of Natural History, and the second in the Australian Museum, Sydney—enables us to say they are synonomous. This view is upheld by a memorandum in the handwriting of the late Mr. E. J. Miers attached to specimens in the British Museum received in exchange from Sydney.

The species is not uncommon at moderate depths in Port Phillip and Western Port, and large specimens from Bass Strait are occasionally exhibited for sale in the fish shops.

Tribe—CYCLOMETOPA.

Family—*Xanthidae.*

Sub-family—*Xanthinae.*

Cycloxanthus (?) punctatus, Haswell. (Pl. III.).

Haswell. Proc. Linn. Soc. N.S.W., 1882, vol. 6, p. 752.

Haswell. Cat. Aust. Crust., 1882, p. 50.

This species is not uncommon in Western Port at moderate depths. It has not been previously figured and the accompanying drawings are taken from a specimen dredged by Mr. C. J. Gabriel off Rhyll.

It has been shown by Miss M. J. Rathbun[1] that the generic name Cycloxanthus to which Haswell referred this crab had been preoccupied and is therefore untenable. She therefore proposed the name Cycloxanthops for the inclusion of the species of the genus known to her. In her re-definition of this genus,[2] however, she has included certain features more particularly those relating to the front, which is described as being "horizontal, produced and divided by a median fissure into two deep lamellate lobes, which are truncated and separated from the internal orbital angles by a deepish notch," and which we submit exclude the species under consideration.

C. punctatus, Haswell, it appears to us, would be more properly included in the genus Lioxantho, Alcock.[3] Xantho punctatus, M.-Edw., having, however, been transferred to that genus, our species would, if it is to be properly referred here, require a new specific name for which we would propose that of Lioxantho haswelli.

Tribe—CYCLOMETOPA.

Family—*Xanthidae.*

Sub-family—*Pilumninae.*

Pilumnus pilosus, sp. nov. (Pl. IV., Figs. 1-4).

Carapace transverse, flattened, the dorsal anterior portion covered with a dense tomentum, posteriorly less thickly clothed. The frontal and anterior lateral margins carry a long silky fringe which entirely obscures all the marginal and orbital characters; sparingly tomentose below. Regions fairly defined.

After removal of the hairs from the surface it is found to be smooth, the anterior lateral margins are a little shorter than the posterior and are divided into four obscure lobes of which the last pair are the smallest. Front considerably depressed and divided by an obscure median sulcation. Orbits visible from above, small, their upper margin with two small fissures. The basal antennal joint nearly reaches the frontal process, the flagellum occupying the inner orbital hiatus, epistome well defined, transverse.

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[1] Rathbun. Proc Biolog Soc. Washington, 1897, vol. 11, p. 164.

[2] Rathbun · Brachyura and Macrura of Porto Rico in the United States. Fish Commission Bull for 1900, vol. 2., p. 27.

[3] Alcock. Journal Asiatic Soc. Bengal, vol 67 (2), p. 90, 1898.

Chelipedes sub-equal, smooth, and polished on under surface.

The merus trigonus, very short, without hairs, smooth and polished, its upper margin somewhat reflexed, sharply cristate.

The carpus clothed on the outer surface with a dense tomentum and fringed with long hairs, the surface granulate.

The propodus nearly as deep as long, similarly clothed except a large triangular space on the outer surface which is porcelain-white, smooth, polished, and finely punctate.

The fingers short and stout, pointed, coarsely toothed showing a considerable hiatus when closed, their distal half being black-brown in colour.

Ambulatory legs compressed but not cristate, all the joints fringed with long hairs, the three distal joints of the first three pairs being tomentose, the other joints being clean and polished on their outer surface. The last pair have all the joints fringed and tomentose.

Post-abdomen of the male and female with seven segments, the last two entirely filling the space between the bases of the last pair of ambulatory legs.

This species is not uncommon under stones between tide lines in Port Phillip and Western Port, though it may easily be overlooked as it lies very close, its colour and clothing protecting it.

REFERENCES.

Haswell[1] has a note identifying a specimen taken at Port Molle, Queensland, as Pulumnus fimbriatus, Milne-Edwards,[2] in which Miers[3] agrees. The latter author fully described it, and forms a new genus (Cryptocaeloma) for its reception.

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[1] Haswell. Cat. Aust. Crust., 1882, p. 66, pl. 1, fig. 4.
[2] Milne-Edwards. Hist. Nat. Crust., 1834, t. i., p. 416.
[3] Miers. H.M.S. Alert, 1884, p. 227, pl. 23, fig. A.
Miers. H.M.S. Challenger, 1886, p. 149.

One of us, on a recent trip to the north-east Queensland Coast, obtained a specimen of the species taken by Haswell and by the "Alert," but on comparison with the South coast habitant there seems a possibility that it is not Milne-Edwards species, and that the South coast species is more likely to be P. fimbriatus, Milne-Edwards, whose description is so meagre.

Pilumnus fimbriatus was described by Milne-Edwards in his Hist. Nat. Crust. as from Australia. He appears to have been dealing at the time with numerous species collected by the "Astrolabe" which vessel called at Western Port, a number of his forms being characteristic denizens of Bass Strait. This circumstance would seem to favour our suggestion as to the true identity of Pilumnus fimbriatus. This matter can only be settled by comparison of the two species with the type in the Paris Museum.

The whole genus requires revision and this species, like other Australian forms, cannot remain in the genus as at present defined. We have therefore described the southern form under the name of Pilumnus pilosus, plateing it and the northern form side by side, leaving some future monographist to settle the synonomy and generic standing.

The subjects of these plates have been lodged in the National Museum, Melbourne.

Tribe—CATOMETOPA.

Family—*Gonoplacidae*, Dana.

Sub-family—*Pseudorhombilinae*, Alcock.

Genus—*Litocheira*, Kinahan.

Litocheira bispinosa, Kinahan.

Kinahan. Journal Roy. Dublin Soc., vol. 1, 1858, pl. 3, fig. 1, a.

A reference to Dr. Kinahan's specimens in the British Museum of Natural History enables us to say that Melia brevipes, Haswell (Cat. Aust. Crust., p. 72, pl. 1, fig. 7, 1882) is a synonym of the above species. Melia brevipes was recorded by Haswell from Griffith's Point, Western Port. The species is not an uncommon one in Port Phillip and Western Port.

Tribe—CATOMETOPA.

Family—*Hymenosomidae*, Ortmann.

Genus—*Trigonoplax*, M.-Edw.

Trigonoplax, Milne-Edwards. Ann. Sci. Nat. Zool. (3), 20, 1853, p. 224.

Alcock. Jour. Asiatic Soc. Bengal, vol. lxix., part 2, no 2, 1900, p. 386.

"This is best regarded as a subgenus of Elamena, from which it differs only in the following unimportant particulars:—(1) the edge of the carapace is not turned up, (2) the interantennular septum is a mere ridge, (3) the chelipeds in the male, as in the female, are very slender."—(Alcock).

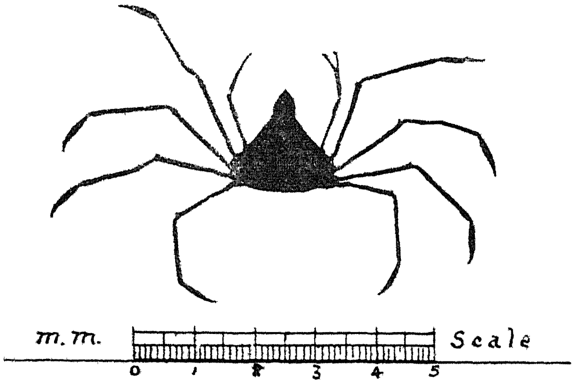
Elamena (Trigonoplax) unguiformis, de Haan.

Elamene unguiformis, de Haan. Faun. Japon Crust., p. 75, pl. 29, fig. 1, and pl. H. Henderson, J. R Trans. Linn. Soc. Zool. (2), vol. 5, 1893, p. 394.

Trigonoplax unguiformis, Milne-Edwards. Ann. Sci. Nat. Zool. (3), 20, 1853, p. 224.

Ortmann. Zool. Jahrb. Syst. 7, 1893-94, p. 31.

Elamena (Trigonoplax) unguiformis, Alcock. Journ. Asiatic Soc. Bengal, vol. 69., part 2, no. 2, 1900, p. 387.



Elamena unguiformis.

"Carapace smooth, flat; lamella broadly pentagonal with the postero-lateral sides about a third as long as any of the others, the regions not defined, the sides entire, unarmed. Front a broad, horizontal, triangular lamina. No post-ocular tooth; eyes not concealed by the front, though the eyestalks are. Inter-annular septum a mere ridge. Epistome as long as broad. Chelipeds and legs smooth and slender. Chelipeds not stouter than the legs, about 1½ times as long as the carapace; fingers slender, as long as the slender sub-cyclindrical palm, their tips spooned.

The anterior border of the meropodite of all the legs ends in an inconspicuous denticle, the dactylus of all is long, sub-falciform and strongly compressed, and has two or three denticles at the top of the posterior border. The second and third pairs of legs, which are the longest, are more than three times the length of the carapace."—(Alcock).

Dredged off Rhyll, Western Port, Victoria, by J. Gabriel.

Sub-order—BRACHYURA ANOMALA.

Family—*Dromiidae.*

Platydromia thomsoni, nobis.

Proc. Roy. Soc. Victoria, vol. 14 (n.s.), 1902, pl. 2, p. 57.

Stebbing (Marine Investigations of South Africa, vol. 4, Crust., pl. 3, p. 60, 1905) states that it is not clear from our description whether it is intended to indicate that the sternal sulci of the female terminate between the chelae or between the first pair of ambulatory legs.

To render our description more clear, we take this opportunity of adding that the sulci end on the chelipede segment of sternum, and a line drawn across the sternum from the point of articulation of the basal joint of the cheliped with the sternum just touches the anterior margin of the curved ridges which meet in the centre line.

Family—*Callianassidae.*

Genus—*Callianassa*, Leach.

Callianassa ceramica, sp. nov. (Plate V.).

The cephalothorax, abdomen and appendages in dried specimens are everywhere of a pale cream colour with a highly glazed surface like fine china. In living examples, however, and specimens preserved in spirits, the skeleton is found to be imperfectly calcified except in the chelipedes.

The cephalothorax is about one-third the total length of the body, and is laterally compressed. The rostral point is short, but is well defined and extends considerably beyond the lateral angles, which are only faintly indicated. A well-defined groove on the dorsal surface runs parallel with the front, extending downwards as far as the base of the outer antennae, and thence in two parallel lines, one on each side defining the branchial region and curving upwards and backwards to meet near the posterior margin. The cephalothorax is otherwise perfectly smooth.

The abdomen is much flattened dorso-ventrally. The first segment is narrowed anteriorly and is membranous. The second is somewhat more calcified, but not so much as those succeeding.

The longest segments are the second and sixth, which are subequal, being followed in diminishing sequence by the fifth, third, fourth and first. The first two segments are quite smooth, the following three are fringed with strong hair, and the final segment also carries a few short hairs. No dorsal carina or spines are present on any of the segments.

The eye-lobes are rounded, and contiguous on their inner margins. The eyes are small and only slightly pigmented.

The first antennae are about three-fourths as long as the second. The first joint extends beyond the eye-lobes, the second is slightly longer than the first, and the flagella which carry a few slender setae are as long as the first two joints combined. The second antennae are as robust as the first but have a shorter peduncle and much longer lash.

The third maxillipeds have the third and fourth joints rounded and much swollen, with their line of junction wide and truncated, the two joints together being subglobose. From the point of insertion of the fifth joint there runs across their inner faces to the articulation with the second joint a finely serrate ridge. All the joints from the third upwards are sparingly fringed with hair.

Of the chelipeds either the right or left may be the larger. The larger cheliped has a few small serrations on the lower margin of the third joint, but the upper is unarmed. The fourth has a well-defined ridge running longitudinally down its outer face. On its lower margin there is a long anterior crest, and near its distal end a well-defined tooth-like lobe. Both are evenly serrate on the edge. The fifth joint is only three-quarters as long as broad, and is clothed with a few scattered tufts of hairs along its lower margin. The sixth joint is of the same width as the fifth—the palm is subquadrate and the surface is deeply pitted in its lower half. The thumb is unarmed but carries several scattered tufts of stiff hairs. The seventh joint, which also bears scattered tufts of hair, slightly overlaps the thumb at its distal extremity. It carries a faintly indicated tooth in its distal half, and a strongly doubly crowned molar-like tooth near the point of articulation.

The smaller cheliped has the hand and palm of the same breadth and approximately the same length. The fingers are separated by a wide interval, and the dactylus carries a small tooth in its distal third.

All the pereiopods are much flattened and leaf-like. The last four pairs have the shape characteristic of the family, and all are sparingly clothed with hairs. The fifth pair are subchelate.

The telson is of the same length as the last segment of the abdomen. It is unarmed, and has its posterior margin rounded and sparingly clothed with short hairs on its margin.

Both of the uropods are longer than the telson. They are rounded at their distal ends and carry a strong fringe of hairs on their outer margin.

The length of the type from the tip of the rostrum to the end of the telson is 53 mm.

These specimens appear to us to vary sufficiently from any of those mentioned by Stebbing in his recent enumeration of the family[1] to entitle them to specific rank. The species in its general appearance strongly suggests Trypaea australiensis, Dana, from which it differs in the inner antennae not bearing a deep, comb-like fringe of hairs, in the shape of the larger chelipede and in other features.

We have taken it burrowing in muddy flats in both Port Phillip and Western Port

The type will be deposited with the National Museum, Melbourne, and a co-type with the Australian Museum, Sydney.

Genus **Trypaea**, Dana.

"Near Callianassa in outer maxillipeds and feet, inner antennae sub-pediform, flagella shorter than last basal joint."—(Dana).

Trypaea australiensis, Dana.

Trypaea australiensis, Dana. U.S. Explor Exped Crust., 1852, 1, p. 573, pl. 32, fig. 4a, b, c,

Trypaea porcellana, Kinahan. Jour. Roy. Dublin Soc., 1, 1858, p. 130, pl. 4, fig. 2.

"Front not triangular, anterior feet much compressed, arm, carpus and hand having an acute edge above. Larger hand broad, smooth, but little longer than carpus; fingers nearly half as long as hand not gaping, finely denticulate within, superior finger a little the longer, arcuate; carpus somewhat smaller than hand, arm having a cultriform process below near the base; caudal segment about as long as broad, nearly rounded at apex, length two and three-fourths inches. Eyes on very short peduncles. Outer antennae about half as long as body. Fingers with a few short tufts of hair. Lower as well as upper edge of hand, arm and carpus acute.

District of Illawarra, New South Wales, along shores."—(Dana).

Trypaea australiensis was described by Dana from a specimen taken at Illawarra, N.S.W. It is exceedingly abundant, burrowing in muddy flats at many parts of our coast and in New South Wales, and we have a large series from numerous collecting grounds, including the type locality of Dana.

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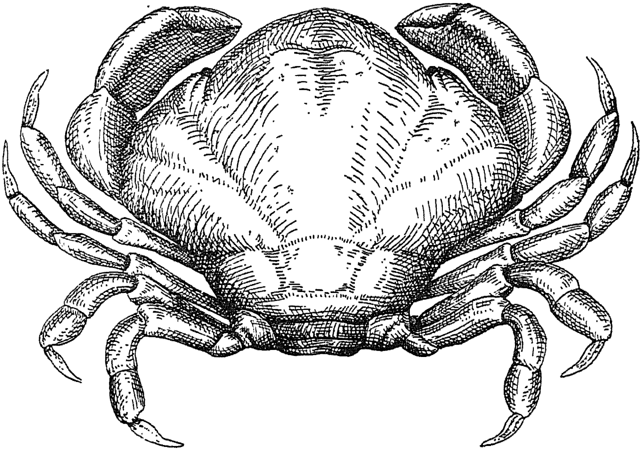
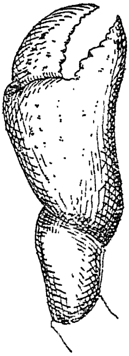
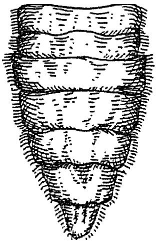
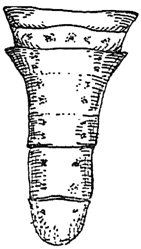
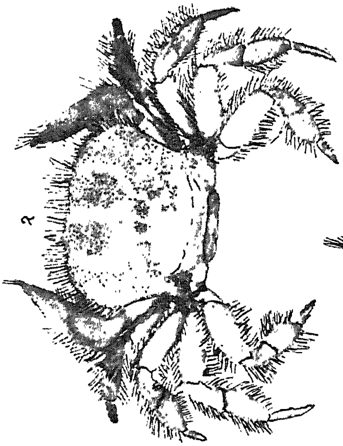
[1] Marine Investigations of South Africa, 1903, p. 38.







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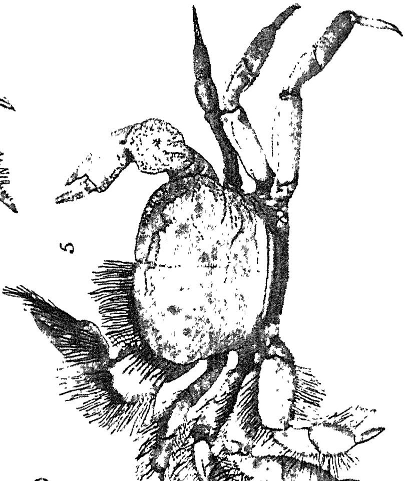
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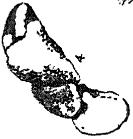
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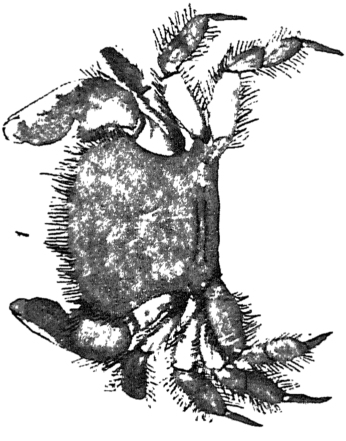
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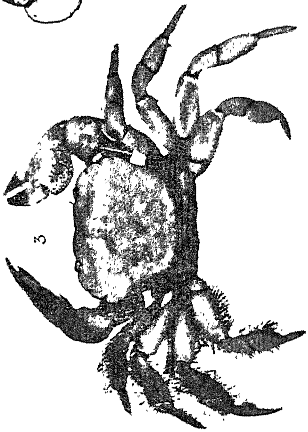
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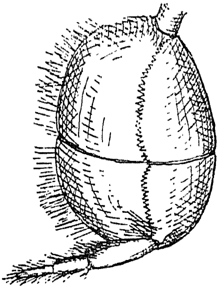

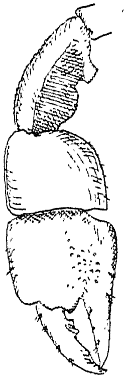

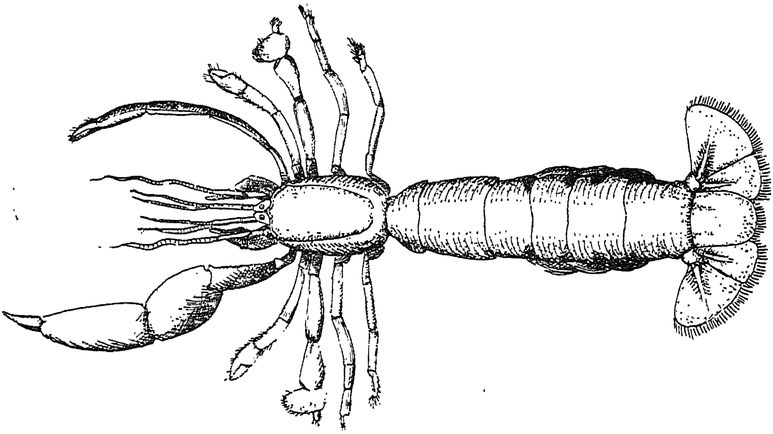

T. porcellana was described by Kinahan from Port Phillip. He differentiates Dana's species from it "in wanting the triangular teeth on the movable finger and forearm, in having the inner part of the fingers finely denticulate and in not having the front of the carapace produced as a small triangular rostrum"

The diagnostic characters given by Kinahan for his species we have found to be invariably characteristic of the male, while Dana's figure and description correspond to the female. This we have found to be true after examination of a large number of specimens and we have no hesitation in giving the synonomy as above.

DESCRIPTION OF PLATES

PLATE III.

Cycloxanthus punctatus, showing whole animal; and chelipede and abdomen of male and of female.

PLATE IV.

Fig. 1—Pilumnus pilosus. ♂
„ 2—Pilumnus pilosus ♀
„ 3—Pilumnus pilosus (Type), from which the tomentum and hairs have been rubbed off to allow outline of carapace to be seen.
„ 4—Pilumnus pilosus. Side view of cheliped with hair removed.
„ 5—Cryptocaeloma fimbriatum, Miers, partly denuded of hair.

PLATE V.

Callianassa ceramica, sp. n. Whole animal, third maxillipede and large and small chelipedes.

[Proc. Roy. Soc. Victoria, 19 (N.S.), Pt. I., 1906].

Art. III.—*Census of the Victorian Decapod Crustacea. Part I. (Brachyura).*

By S. W. FULTON and F. E. GRANT, F.L.S.

[Read 10th May, 1906.]

No catalogue of the crabs occurring in Victorian waters has so far been published. The attached list represents the authenticated occurrences of species of Brachyura so far as we have been able to ascertain, either from our own collecting or from published records. Doubtful records and inadequately diagnosed species are excluded from the list, which must, however, only be regarded as provisional. Further collecting, and more particularly further dredging in deep water, will doubtless in the future enormously increase the number of recorded species, but it appears desirable to submit this list as a starting point for further work. We may say that we have several species, not here enumerated, about the nomenclature of which we are not satisfied.

In the arrangement and natural sequence we have followed Dr. A. Alcock's "Materials for a Carcinological Fauna of India."[1]

BRACHYURA OXYRHYNCHA

Family—MAIIDAE.

Sub-family—INACHINAE.

Achaeus tenuicollis, Miers. Off Port Phillip, 33 fathoms; off East Moncœur Island (Challenger).

Gonatorhynchus tumidus, Haswell. Port Phillip (fairly common).

Halimus truncatipes, Miers. Western Port.

Halimus tumidus, Dana. Port Phillip; Western Port.

Halimus spinosus, Hess. Port Phillip.

Microhalimus deflexifrons, Haswell. Port Phillip; Western Port; Wilson's Promontory.

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[1] Jour. Asiat. Soc. Bengal, 1895-1900.

Sub-family—ACANTHONYCHIDAE.

Huenia bifurcata, Streets. Port Phillip and Western Port (in rock pools).

Sub-family—MAIINAE.

Paramithrax sternocostulatus, A. M.-Edws. Port Phillip Heads (J. B. Wilson in Coll. Brit. Mus.).

Paramithrax peronii, M.-Edws. Wilson's Promontory (Kershaw).

Leptomithrax australiensis, Miers. Port Phillip; Bass Strait.

Chlorinoides spatulifer, Haswell. Western Port.

Micippa spinosa, Stimpson, var. affinis, Miers. Off East Moncœur Island (Challenger).

Paramicippa tuberculosa, M.-Edws. Port Phillip; Western Port. (Fairly common).

Micipoides longimanus, Haswell. Port Phillip; Western Port.

BRACHYURA CYCLOMETOPA, OR CANCROIDEA

Family—XANTHIDAE.

Sub-family—XANTHINAE.

Lioxantho haswelli, Fulton and Grant. Western Port.

Sub-family—ACTAEINAE.

Actaea peronii, M.-Edws. Port Phillip; Western Port; Off East Moncœur Island (Challenger).

Sub-family—MENIPPINAE.

Pseudocarcinus gigas, Lam. Port Phillip; Warrnambool; Portland; Bass Strait.

Sub-family—PILUMNINAE.

Pilumnus monilifer, Haswell. Port Phillip; Western Port.

Pilumnus rufopunctatus, Stimpson. Western Port (Haswell).

Pilumnus tomentosus, M.-Edws. Port Phillip; Western Port; Bass Strait.

Pilumnus lanatus, Latr. Western Port.

Pilumnus pilosa, Fulton and Grant. Between tide lines, Western Port.

Pilumnopeus serratifrons, Kinahan. Port Phillip; Western Port.

Family—PORTUNIDAE.

Sub-family—CARCINAE.

Carcinides maenas, Linn. Common in Port Phillip. An introduced species.

Nectocarcinus integrifrons, Latr. Port Phillip; Western Port.

Sub-family—PORTUNINAE.

Ovalipes trimaculatus, de Haan. Port Phillip; Western Port; Wilson's Promontory.

Portunus corrugatus, Pennant. Port Phillip Heads (J. B. Wilson and Challenger); East Moncœur Island (Challenger).

BRACHYURA CATAMETOPA, OR GRAPSOIDEA

Family—GONOPLACIDAE.

Sub-family—PSEUDOTHOMBILINAE.

Litocheira bispinosa, Kinahan. Port Phillip; Western Port.

Family—PINNOTERIDAE.

Sub-family—PINNOTERINAE.

Pinnoteres pisum, Linn. Port Phillip; Western Port; Anderson's Inlet (common in shells of Mytilus, Modiola, etc.).

Pinnoteres obesa, Dana. Dredged off Shoreham, Western Port.

Family—OCYPODIDAE.

Sub-family—OCYPIDINAE.

Heloecius cordiformis, M.-Edws. Mangrove flats, Western Port; Wilson's Promontory (Kershaw).

Sub-family—MACROPHTHALMINAE.

Microphthalmus latifrons, Haswell. Fisherman's Bend, Port Phillip; Mangrove flats, Western Port; Wilson's Promontory (Kershaw).

Family—MICTYRIDAE.

Mictyris platycheles, M.-Edws Common at low tide on sandy beaches.

Family—HYMENOSOMIDAE.

Hymenosoma ovatum, Stimpson. Port Phillip; Western Port; Port Fairy; Lake Tyers (common).

Hymenosoma australe, Haswell. Williamstown, on mud flats mouth of Yarra River; Lake Tyers.

Hymenosoma lacustris, Chilton. Lake Colac; Moorabool River; Fraser Creek, Wilson's Promontory. A fresh-water species.

Hymenosoma rostratum, Haswell. Port Phillip; Western Port. Fairly common, dredged.

Elamene (*Trigonoplax*) *unguiformis*, de Haan. Dredged off Rhyll, Western Port (Gabriel).

Family—GRAPSIDAE.

Sub-family—GRAPSINAE.

Leptograpsus variegatus, Fab. Lakes' Entrance.

Sub-family—VARUNINAE.

Planes minutus, Linn. A cosmopolitan species.

Sub-family—SESARMINAE.

Casmagnathus haswellianus, Whitelegge. Port Phillip; Western Port.

Casmagnathus gaimardii, M.-Edws. Port Phillip; Western Port.

Casmagnathus quadridentatus, M.-Edws. Common on coast and islands in Bass Strait.

Casmagnathus laevis, Dana. Port Phillip; Western Port; Lakes' Entrance.

Cyclograpsus punctatus, M.-Edws. Port Phillip. (Common).

Brachynotus spinosus, M.-Edws. Port Phillip. (Common).

Sub-family—Plagusinae.

Plagusia capensis, de Haan. Bass Strait.

BRACHYURA OXYSTOMA, OR LEUCOSOIDEA

Family—LEUCOSIIDAE.

Sub-family—Leucosiinae.

Merocryptus lambriformis, A. M.-Edws. Off East Moncœur Island (Challenger); Port Phillip Heads (J. B. Wilson).

Ebalia lambriformis, Bell. Bass Strait (Brit. Mus.).

Ebalia crassipes, Bell. East Moncœur Island (Challenger); Western Port.

Ebalia dentifrons, Miers. Western Port.

Ebalia intermedia, Miers. Port Phillip; Western Port. (Common 4 to 10 fathoms).

Ebalia tuberculosa, A. M.-Edws. Off East Moncœur Island (Challenger).

Ebalia undecimspinosa, Kinahan. Fisherman's Bend, Port Phillip.

Philyra laevis, Bell. Port Phillip; Western Port. Common on sandy flats near low tide line.

BRACHYURA PRIMIGENIA, OR DROMIACEA

Family—DROMIIDAE.

Cryptodromia lateralis, Gray. Port Phillip; Western Port.

Cryptodromia wilsoni, Fulton and Grant. Port Phillip Heads (J. B. Wilson); Wilson's Promontory (Kershaw).

Dromia australiensis, Haswell. Western Port (Sayce).

Dromia excavata, Stimpson. Port Phillip; Western Port.

Dromia octodentata, Haswell. Western Port.

Platydromia thomsoni, Fulton and Grant. Western Port.

END OF VOL. XIX., PART I.

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[PROC. ROY. SOC. VICTORIA, 19 (N.S.), PT. II., 1906].

ART. IV.—*New or Little-known Victorian Fossils in the National Museum.*

PART VIII.—SOME PALAEOZOIC BRITTLE-STARS OF THE MELBOURNIAN SERIES.

BY FREDERICK CHAPMAN, A.L.S., &c,

National Museum.

(With Plates VI.-VIII.)

[Read 11th October, 1906].

INTRODUCTORY REMARKS.

An examination of the Silurian Ophiurids and Asterids in the National Museum affords ample proof that our Victorian palaeozoic rocks are nearly as rich in these forms of life as the Ludlow series of Herefordshire and the Lake District in England, or the closely correlated strata of N. America. Both the mudstones and the argillaceous sandstones of the Melbournian division of our Silurian rocks have furnished numerous remains of the former group, the Brittle-stars, and perhaps needless to say, the mudstones retain the sharper impressions of the fossils. So fine-grained, however, is some of the sandstone rock that a sharp positive in wax or plasticine can often be obtained from it, shewing the finer ossicles or even the spines.

The genus newly described here under the name of Gregoriura is represented by a large and ornate species possessing somewhat remarkable characters, and for which a place may be found, provisionally, in the family Protasteridae. Another ophiurid, of which further details are now made known, was described by Prof. J. W. Gregory in 1889[1] under the name of Protaster brisingoides, and was at the time the only described species of this particular group from Victorian palæozoic rocks.

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[1] Geol. Mag., dec. iii., vol. vi., 1889, p. 24.

The original specimens were from Flemington, and they are incorporated in the collection at the British Museum (Nat. Hist.), London. On account of the peculiar structure of these specimens, Gregory subsequently transferred the species to a new genus, Sturtzura, making it the genotype, the genus also including the Protaster leptosoma of Salter.[1] The numerous specimens of P. brisingoides in the National Museum, Melbourne, having afforded clearer data as to arm-structure than was possible when the original specimens were described in London, this fresh evidence necessitates a somewhat different interpretation of the arrangement and form of the ossicles on the ventral surface, and restores the species to its original genus. As a typical Protaster, this fossil has more or less boot-shaped ambulacral ossicles, closely approaching those of P. biforis, Gregory.[2] In consequence of this determination Sturtzura leptosoma may now be considered as the type of the genus.

The third form now described is an elegant little species closely related to Sturtzura leptosoma, and which I have named on this account S. leptosomoides.

DESCRIPTION OF THE SPECIMENS.

Class—OPHIUROIDEA.

Family—*Protasteridæ.*

Genus—*Protaster*, Forbes, 1849.

Protaster brisingoides, Gregory.

(Pl. VI., Fig. 2; Pl. VIII., Fig 2).

Protaster brisingoides, Gregory, 1889. Geol. Mag., dec. iii., vol. vi., p. 24, woodcuts, figs. 1-4 (p. 25),

Sturtzura brisingoides, Gregory, 1897. Proc. Zool. Soc. (for 1896), p. 1034.

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[1] Proc. Zool. Soc. Lond. (1896), 1897, pp. 1034, 1035.

[2] Proc. Zool. Soc. (1896), 1897, p. 1033, fig. 3.

Observations.—An extensive series of the above fossil was collected by the first Victorian geological surveyors, from Moonee Ponds Creek, Flemington, then comprised in "Royal Park"; these were deposited in the National Museum collection, and bore the MS. name given by McCoy—"Taeniaster australis"[1] McCoy also referred to these fossils in the Progress Report of the Geological Survey of Victoria[2] under the same MS. name, and they were reported to have come from Melbourne and the Upper Yarra. The latter locality reference would imply that these ophiurids also occurred in the Yeringian series. I had, however, been unable to find any specimens of this group in the Museum collections as from the Upper Yarra district until quite recently, when two examples from the "Parish of Yering, Sect. XII.," were discovered

Whilst examining in detail the various fossils found in the sandstone at Flemington their general negative character was noticed; and upon taking a wax impression from a remarkably sharp sandstone cast of P. brisingoides, the shape of typical protasterid ossicles was revealed, together with a deep sinuous ventral canal. This impression satisfactorily explains the presence of the "median ridge," the nature of which, Prof. Gregory observed, is doubtful.[3] Since the fossils appear to be in the form of negative casts, the ossicle structure of the arm requires a different explanation. Prof. Gregory, kindly replying to a letter giving my own explanation of the structure of this fossil, writes, under date July, 1906, as follows:—"If the specimen can be interpreted as by your drawing it becomes very much easier . . . . The sinuous ridge I could not understand, and if it can be explained away so much the better."

Emended and Additional Description.

As in P. biforis, Gregory,[4] the ambulacral ossicles consist of a thick body and a curved wing, and are in some portions of the arm almost halberd-shaped. The distal margin is twice notched, and the proximal margin is circularly excavated, so that the podial area is almost elliptical. The podial orifices are thus represented in the negative cast by a double series of elliptical to subquadrate rounded prominences, separated by the sinuous ridge-like cast of the ambulacral furrow. The ambulacral ossicles are fusiform and curved, the pointed proximal end being directed inwards. The ambulacral canal is flexuose and bordered by the curved inner margins of the ambulacrals. The ambulacral ossicles are sometimes thicker than here drawn, and have the notches more pronounced. The adambulacral plates are generally so close as to form an almost uninterrupted marginal border. No trace of a disc has been detected in the specimens before us, and the spines, if any, have not been preserved.

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[1] See Gregory op. cit., 1889, p. 26; also R. Etheridge, Junr. Records Australian Museum, vol. i., No. 10, 1891, p. 199.

[2] No. 1, 1874, p. 34.

[3] Geol. Mag., dec. iii., vol. vi., 1889, p. 25, fig. 2.

[4] Proc. Zool. Soc. (1896), 1897, p. 1033, woodcut, fig. 3.

Measurements of specimens in National Museum.

	Spec. A	Spec. B.	Spec. C.
Length of arm	20 mm.	24 mm.	?
Diameter of arm at base	3 mm.	2 mm.	3.5 mm.
Diameter of arm near distal end	2 mm.	1.5 mm.	?

Occurrence.—This species is of frequent occurrence in the Silurian (Melbournian) sandstone of Moonee Ponds Creek, Flemington. It also occurs rarely in the Yeringian series at Yering.

Genus—*Gregoriura*[1] nov.

Generic characters.—A Protasterid in which the usual boot-shaped ambulacrals are laterally developed, and modified into a subtriangular form. Ossicles on each side of the ambulacral canal subalternate, excepting at the junction with the mouth-frames, where they are parallel. Adambulacral ossicles narrow, slender, extending laterally in a line with the proximal border of the ambulacral ossicle. Spine-bearing plates, slender, at right angles to the adambulacrals, carrying (in the genotype) two conspicuous spines. Oval skeleton having jaw-plates $\frac{3}{4}$ the length of the mouth-frames; teeth thick and prominent. No traces of a disc preserved in the specimen on which the genus is founded. Arms very slender and very flexible.

Named after Professor J. W. Gregory, F.R.S., who has devoted so much attention to the elucidation and classification of this group of the echinodermata.

Gregoriura spryi, gen. et sp. nov.

(Pl. VI., Fig. 1; Pl. VIII., Figs. 1, 3).

Description.—This species is quite the largest ophiurid known from Australian rocks, since it must have covered a circular area having a diameter of at least 72 mm. The oral framework is well-preserved as a limonitic cast, the five rhomboidal groups being distinctly separate. The angle made by the junction of the elements composing the mouth-frame and the jaws is strongly marked. The jaw plates are laterally slightly concavo-convex. The mouth-frames near the junction of the arms are partly supported by the embracing character of the ambulacrals. The ossicles of the arm consist of subtriangular ambulacrals having a sinus on the distal face for the passage of the podia, whilst the proximal face is broadly excavated; extending from the proximal end of each ambulacral is a slender ambulacral, and apparently fused to this, and at right angles, is a spine-bearing plate, having generally two strong spines, one directed outwards, the other towards the arm tip.

Dimensions.—

Length of longest arm - - - -	32 mm.
Width of arm at base - - - -	3 mm.
Length of ambulacral ossicles - -	circâ 1 mm.
Length of syngnaths - - - -	1.75 mm.

Observations.—The above type specimen is named in recognition of its finder, Mr. F. P. Spry, who has kindly presented it to the National Museum. This specimen is very nearly perfect, as it shows the whole of the oral framework and the five arms, one of the latter being only slightly damaged by fracture. The ophiurid lies on the slab of mudstone with the arms undulate and grouped toward one side. The flexure of the arms points to the particularly free character of the ossicles in regard to movement. The deposition of sediment upon this brittle-star must have been very quiet and gradual, for even the superficial contour of the central area of the animal has been preserved, showing it to have been strongly convex.

Horizon and Locality.—Silurian (Melbournian). In the blue and ochreous shale of the Yarra Improvement Works, S. Yarra.

Family—*Palæophiuridae.*

Genus—*Sturtzura*, Gregory, 1897.

Sturtzura leptosomoides, sp nov.

(Pl. VII., Pl. VIII., Fig 4)

Description.—Arms very flexible, moderately broad in the middle, very slender towards the distal end. Disc not visible in specimens now described. Mouth-frames slender, separate, shorter than the jaws. Oral framework having a diameter of 4 mm. in our examples. Ambulacral ossicles subquadrate, broader proximally, with a podial sinus on the distal and outer faces. Adambulacrals narrow, curved, fusiform, and disposed obliquely, extending outwards towards the arm-tips. Intermediate spine-bearing plates with two or three prominent spines.

Measurement of type specimen.—

Length of arm - - - - - - -	10 mm.
Width of arm at broadest part, viz, 3 mm. from junction with mouth-frame -	2.25 mm.
Diameter of oral pentagon - - -	2.5 mm.

Observations.—P. brisingoides was selected by Gregory as the type of the above genus,[1] but since that species appears to require a somewhat different explanation as to its arm structure, which is related to that of the protasterids, as already shown here, Sturtzura leptosoma, Salter sp.,[2] must now be regarded as the type form. The present species resembles, at first sight, S. leptosoma of the Ludlow beds of the Welsh border so closely that the English and Victorian fossils appeared to be one and the same species. Upon examining their arm-structure, however, it is seen that although generically related, the forms are specifically distinct (see pl. viii., figs. 4, 5).

Horizon and Locality.—Silurian (Melbournian), Moonee Ponds Creek, Flemington. Geol. Surv. Coll.

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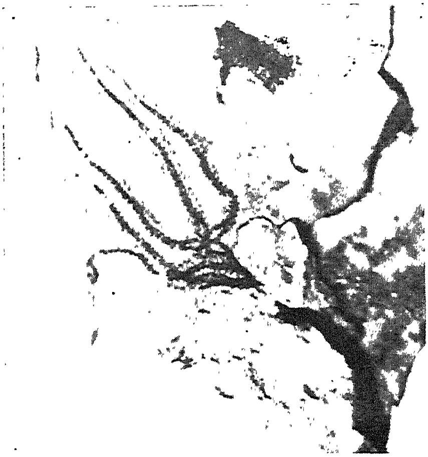
[1] Proc. Zool Soc. (1896), 1897, p. 1034.

[2] Ann. Mag. Nat. Hist., ser ii., vol. xx., 1857, p. 331, pl. ix., fig. 5.



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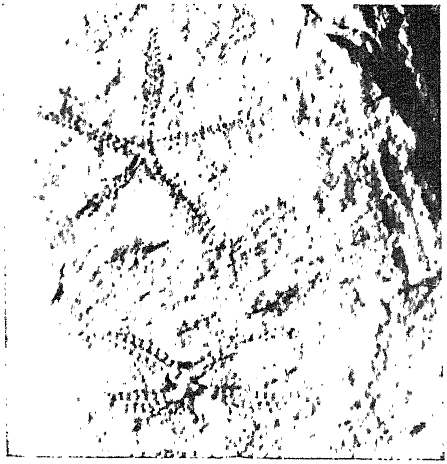

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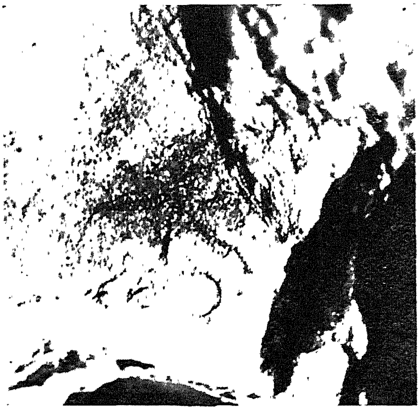
F.C. PHOT.

Silurian Ophiurids, Victoria.



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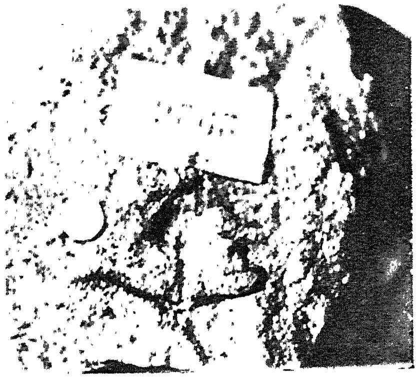

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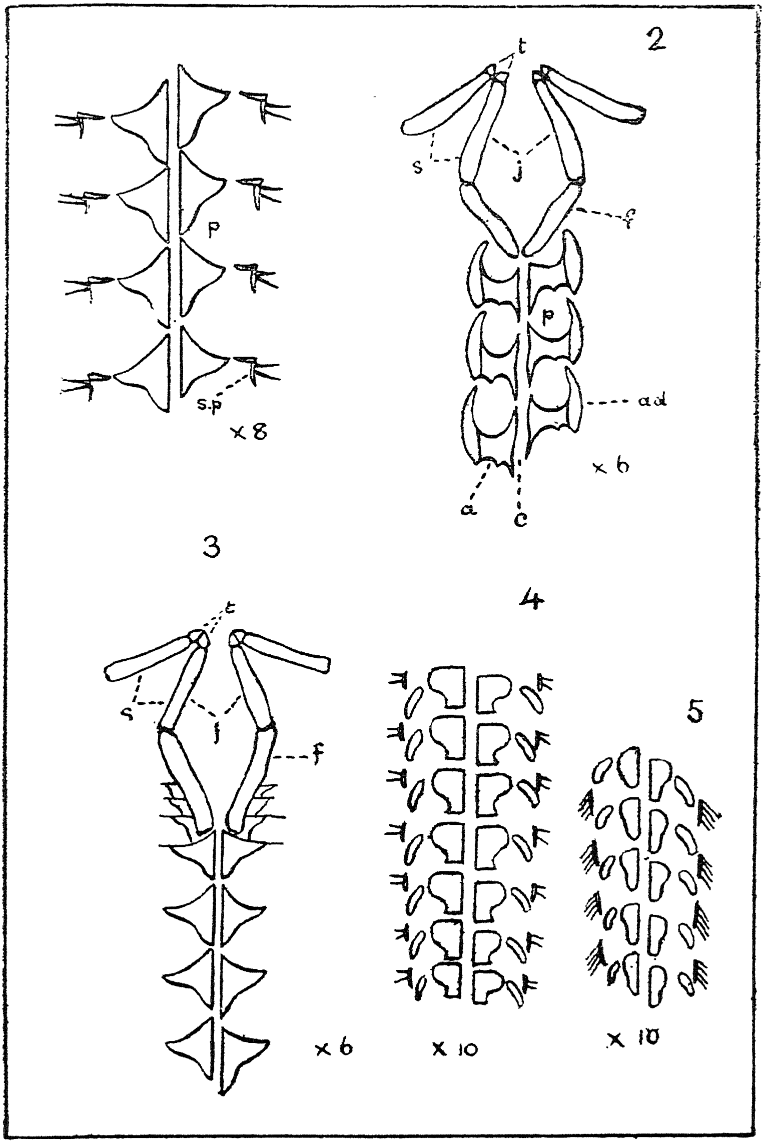
F.C. PHOT.

Silurian Ophiurids, Victoria.



F.C. Structure of Silurian Ophiurids, Victoria.

EXPLANATION OF PLATES.

VI.

Fig. 1.—Gregoriura spryi, sp. et gen. nov. Silurian. S. Yarra. Nat. size.

,, 2.—Protaster brisingoides, Gregory. Negative cast in sandstone of two examples. Silurian. Flemington. Nat. size.

VII.

Fig. 1.—Sturtzura leptosomoides, sp. nov. Silurian. Flemington (Moonee Ponds Creek). Type. × 1½.

,, 2.—S. leptosomoides, sp. nov. Silurian. Flemington. × 1½.

VIII.

Fig. 1.—Arm-structure (ventral aspect) in Gregoriura spryi, gen. et sp. nov. Silurian. S. Yarra. × 8.

,, 2.—Oral and arm-structure in Protaste brisingoiders, Gregory. Silurian. Flemington. × 6.

,, 3.—Oral and arm-structure in Gregoriura spryi, gen. et sp. nov. : showing embracing ossicles in the oral region. Silurian. S. Yarra. × 6.

,, 4.—Arm-structure in Sturtzura leptosomoides, sp. nov. Silurian. Flemington. × 10.

,, 5.—Arm-structure in Sturtzura leptosoma, Salter sp., from specimen in Nat. Mus. Coll. from the Lower Ludlow Series of Leintwardine, Herefordshire (Alfred Marston coll). × 10.

EXPLANATION OF LETTERING.

a, ambulacral ossicles: ad, adambulacral ossicles: c, ambulacral canal; f, mouth-frame; j, jaws; p, podial aperture; s, syngnath; s.p., spine-bearing plate; t, teeth.

[PROC. ROY. SOC. VICTORIA, 19 (N.S.), PT. II., 1906.]

ART. V.—*Description of a New Species of Cypridina from Hobson's Bay, Melbourne.*

BY F. CHAPMAN, A.L.S., &c.

(With Plate IX).

[Read 13th December, 1906.]

PRELIMINARY REMARKS.

The species now described, although hitherto not specifically determined, is one of the most abundant of the Ostracoda inhabiting Hobson's Bay and the adjacent waters of Port Phillip. In the "Victorian Naturalist" for 1894,[1] Mr. J. Shepherd gave an interesting account of the phosphorescence caused by an ostracod, in all probability the present species, off Brighton Beach, Port Phillip. In this notice it was stated that the light emitted, when the water was agitated, "flashed out from distinct points, each about the size of a threepenny piece." The Ostracoda washed up on the sandy beach also showed phosphorescence when "the ground was trodden near to them." Mr. Shepherd further mentions that "a dozen or so in a little water, when shaken, emitted sufficient light to read a watch-dial."

It was this phosphorescent property which led Mr. A. O. Thiele to gather the specimens I am now describing. In order to ascertain whether this form was similarly phosphorescent, and being aware of the phosphorescence of the Cypridinads generally, as well as to endeavour to establish the identity of Mr. Shepherd's ostracod I wrote to Mr. Thiele, who replied as follows:—"In reply to your query I may mention that it was their extraordinary phosphorescence that attracted my attention. While fishing in the Bay about one mile from the shore in about four fathoms of water, I noticed in pulling up the line that the bait was so luminous that I was able to note the time on my watch. I drew the bait through the partially closed hand and thus felt that it was covered with a mass of granular substance which I wiped off and took home. It was difficult to get the phosphorescence off the hands."

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[1] Vol. xi., p. 131.

It is noteworthy that Mr. Shepherd observed the phosphorescent ostracods at Brighton about the end of October, on a calm hot night. Mr. Thiele also procured his gathering in warm weather in the beginning of February, and a further supply which he kindly procured for me, in the living condition, he obtained early in July (midwinter), when they were apparently not so numerous in such shallow water as was then explored.

DESCRIPTION.

Genus—CYPRIDINA.

Cypridina thielei, sp. nov. (Plate IX.)

Male.—Carapace seen from the side, subovate, and widest (highest) in the centre. Dorsal margin strongly arched; ventral, evenly but less strongly curved, and depressed at the anterior third. Anterior extremity with a rounded, blunt beak, curving over the antennal sinus, which is central and not very deeply incised. Posterior extremity produced into a beak-like process, convex on the ventral side, concave on the dorsal. Edge view, elongate-ovate, ends nearly equal.

Figured specimen.—Length, 1.9 mm.; height, 1.2 mm.

Female.—The form of the carapace nearly resembles that of the male, but is larger, and higher near the middle, with the antero-ventral margin distinctly depressed. The antennal notch is deeper and more open; posterior extremity rounded at the ventral corner, and sub-truncate on the dorsal side, with only the faintest indication of a posterior beak.

Figured specimen.—2.17 mm.; height, 1.33 mm.; thickness of carapace just below the middle, 1 mm.

General characters.—Shell thin, polished, and very finely punctate; in places showing opaque spots which apparently increase in size on drying, due to the deposition of phosphate of lime at certain centres. Antennae moderately long for this genus.

Mandibular foot with the conical process at its base, characteristic of Cypridina as defined by G. O. Sars. Vermiform limb with about 6 pairs of fine spines towards the extremity, and two long terminal ones. Caudal lamina with about 13 ungues, gradually decreasing in size from the extremity backwards; the hooks are beset with numerous short spines on the inner surface, to within one-fourth of the tip. Paired eyes large, with about 12 lenses seen in the same plane. Muscle impressions situated about the middle of the anterior third, forming a sub-oval cluster of rounded and elongated spots.

Observations.—The present species is a typical Cypridina, not only because of the presence of the conical process at the base of the mandibular foot, but also on account of the absence of the unguinal process seen in Asterope; it also shows the blunt, beak-shaped point at the posterior extremity usually possessed by Cypridina. Upon examining living examples of Cypridina thielei under the microscope enclosed in the live-box, they were seen to emit a strong steel-blue light for about 10 minutes, and when the luminosity became faint it could be speedily increased by the application of slight pressure. The heart-pulsations, as observed in some living specimens which had been captured about 24 hours previously, and in winter, averaged about 56 per minute.

The carapace of C. thielei, has a very interesting structure, for most of the valves, when mounted in media and placed between crossed nicols under the microscope, show various centres of crystallization due to the local formation of radial groups of crystals of phosphate of lime. These groups show the usual dark cross of crystals having a straight extinction. This calcification may be seen on the dried valves as opaque white patches. Sorby mentions this crystalline radial structure which is so eminently developed in crab shells, as occurring also in Entomostraca.[1] The same structure is also seen, and in a more advanced stage, in the valves of a species of Crossophorus, which Mr. J. H. Gatliff found at Portsea, Port Phillip, Victoria, and kindly favoured me with some short time ago.

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[1] Quart. Journ. Geol. Soc., vol. xxxv., 1879, p. 61.

Although it is assumed from an examination of the already known species of Cypridina that the males only are endowed with swimming power,[1] the present occurrence of females in some abundance on the bait let down off Williamstown seems to show that this species may prove an exception. That the turgid forms were females there can be no doubt, since the eggs were seen in some instances within the valves; the females of this genus hatching their young within the carapace, and not depositing them on water plants like most other Ostracoda. As in the species whose females are non-natatory, the terminal joints of the first pair of antennae in the females of C. thielei are not tufted, but the males bear long tufts, which undoubtedly give them greater swimming power.

Affinities of the Species.—In the form of the carapace C. thielei appears to be quite distinct from any hitherto described species. C. formosa, Dana,[2] may be considered one of the nearest allied forms, differing in having subequal extremities viewed laterally, in the sharp anterior beak, and strongly pronounced punctations or depressions on the surface of the valve. Brady's figure of a specimen referred to Dana's species exhibits a blunt beak, as in ours, but the carapace is altogether higher.

The elongate oval outline of the above species is somewhat like that of C. mediterranea, Costa.,[3] but the latter has a sharp anterior beak, and the edge view shows the carapace to have rounded ends.

C. megalops, Sars,[4] also resembles our species in general form, but this also has an acuminate beak, and in the lateral aspect the valves are higher. In its ovately pointed edge-view C. megalops agrees with C. thielei, but its greatest thickness is below the region where it occurs in the latter.

Habitat.—In moderately shallow water in Port Phillip and Hobson's Bay, feeding upon decaying animal matter.

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[1] Brady, G. S., Rep. Challenger Zool., pt. iii., 1880, p. 151.

[2] United States Expl. Exped., Crustacea 1855, p. 1296, pl. xci., fig. 5; also Brady, G. S., Rep. Chall. Zool., pt. iii., 1880, p. 155, pl. xlii., figs. 9-11.

[3] "Fauna del Regno di Napoli," 1845 (?), pl. iv., figs. 1-14. See also G. S. Brady, "Mon. Marine and Freshwater Ostracoda of the N. Atlantic and N.W. Europe." Trans. R. Dublin Soc., vol. v., ser. ii., part. xii., 1896, p 650, pl. liv., figs. 1, 2; pl. lv., figs. 1-11.

[4] "Undersögelser Hardanger Fjordens Fauna, i. Crustacea." Vidensk-Selsk, Forhandl, p. 278; also Brady, op. supra cit., pl. liv., figs. 5, 6.

The above species is named in honour of Mr. A. O. Thiele, in recognition of his good services in furthering the study of natural history in Victoria.

EXPLANATION OF PLATE IX

Fig. 1.—Right valve of Cypridina thielei (♂), with calcified patches on the carapace. × 24.

„ 2.—Right valve of C. thielei (♀), with calcified patches on the carapace. × 24.

„ 3.—Ventral edge view of carapace of C thielei (♀). × 24.

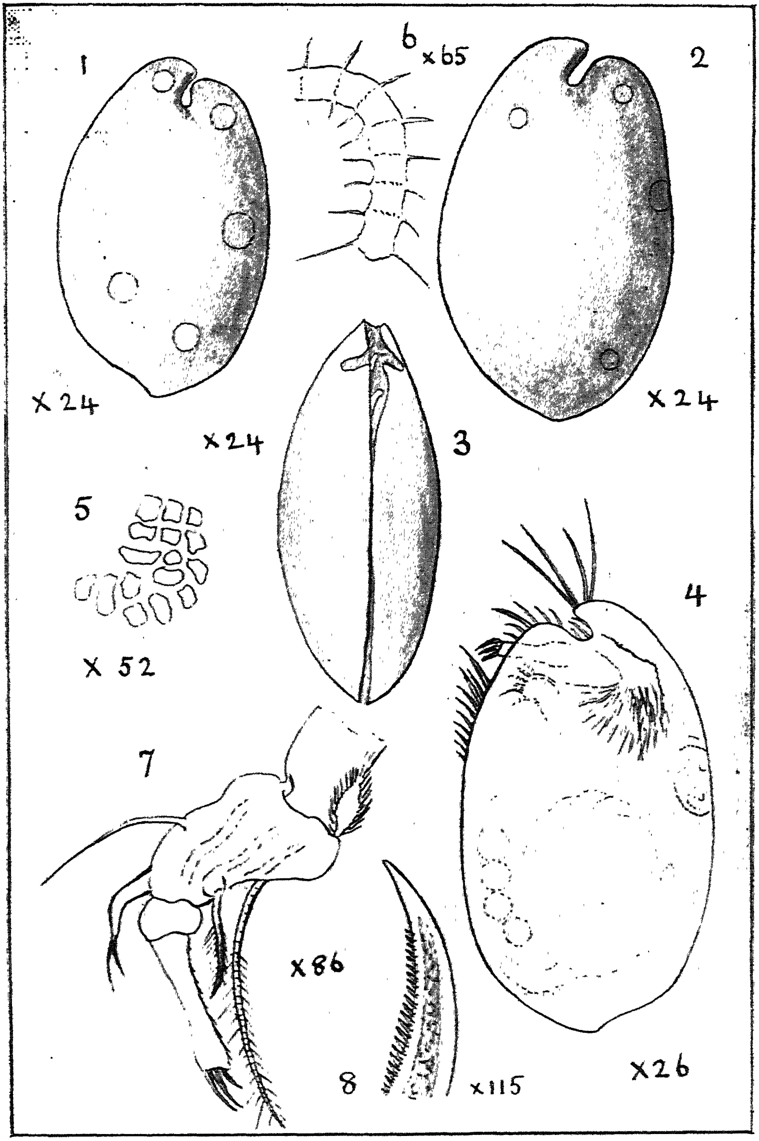
„ 4.—Living example of C. thielei (♀), showing non-tufted antennae, extended mandible and caudal lamina, with indications of the maxilla, heart, stomach, ova and vermiform limb within the carapace. × 26.

„ 5.—Muscle impressions seen on the exterior of a valve of C thielei. × 52.

„ 6.—Vermiform limb. × 65.

„ 7.—Mandibular foot, showing the conical appendage at its base. × 86.

, 8.—One of the hooks of the caudal lamina. × 115



F.C. AD. NAT. DEL.

Cypridina thielei, sp. nov.

[PROC. ROY. SOC. VICTORIA, 19 (N.S.), PT. II., 1906.]

ART. VI.—*Contributions to the Flora of Australia.*

BY ALFRED J. EWART, D.Sc., PH.D., F.L.S.,

Government Botanist and Professor of Botany
in the University of Melbourne.

(With Plates X., XI., XII.).

[Read 13th December, 1906].

AESCHYNOMENE ASPERA, L. var. OLIGARTHRA, F. v. M., Herb. (Leguminosae). Port Darwin, M. Holtze, 1891.

This plant was originally considered by von Mueller to be a new species, but was subsequently referred by him to A. aspera, Linn., to which it undoubtedly belongs. It differs in the fruit having only 1 to 3 rather large segments, each usually 1 cm. broad by 1¼ cm. long, and with nearly smooth side walls, whereas those of the type species are usually covered with warts or papillae, and are 7 to 8 mm. broad by 8 to 10 mm. long. Fruits of a few segments appear also on the type species, and in such cases the segments tend to become larger than in the longer pods. The variety is, however, a strongly marked one, and apparently hitherto unrecorded. A. aspera is new to Australia. The stems of the plants are used by the Chinese for making paper, and it is just possible that the plant may have been introduced by them.

ALBIZZIA (ARCHIDENDRON) PENTZKEANA, F. v. M., Herb. (Leguminosae) = A. vaillantii, F. v. M. Fragm., v. 60, variety Pentzkeana.

A number of specimens of the apparently unpublished species A. pentzkeana were found at the Herbarium. A specimen submitted to Kew was marked by Dr. Stapf "genus correct, species unpublished."

Close comparison with A. vaillantii, however, reveals so many features in common that the plant can only be classed as a variety of that species, differing chiefly in the shape and large size of the leaves and leaflets. Each leaf has a stout common stalk of about 5 cm. length, forking into two paripinnate branches of 30 cm. or more, and bearing 3 or 4 pairs of large elongated ovate leaflets averaging 30 cm. length by 10 cm. broad, on short thick pulvini of about 1 cm.

Fruits and seeds as in A. vaillantii, but the former with more numerous and minute yellow hairs on the outer surface.

ARENARIA AXILLARIS, Luehm. = Stellaria glauca, With., var. axillaris, Luehm. (Caryophylleae).

From material collected by Mr. Reader on the same locality, there can be no doubt that the plant is to be referred to Stellaria glauca, var. The specimens are identical, and have the cleft petals of Stellaria, a point which can not be satisfactorily determined in Luehmann's original specimens.

ASTER DUMOSUS, L. (Compositae).

A North American weed which appears to be spreading in Victoria, and which has evidently reached this State from New South Wales, where it has long been recorded. Our specimens were identical with those in the Herbarium labelled Tripolium conspicuum, Lindl., from the Paris Museum. As this species apparently stands in the Kew Index in spite of the reference to Aster, specimens were sent to Kew and determined as above. Synonyms for A. dumosus, L., are T. conspicuum, Lindl.; Aster imbricatus, Walp. (but not of L.); A. arenaroides, Eaton.

Bellida, new genus (Compositae).

Annuals or perennials with radical leaves, and inflorescences at the ends of long simple stalks, leafless, or with a small bract on the shaft. Bracts of the involucre imbricate, scarious in a double series, the inner ones larger. Florets all alike, regularly 5-toothed, tubular and yellow, with no scales between them. Anthers with well-marked appendices and with rounded bases. Style and stigma of Asterae. Fruit on a distinct stalk, and obliquely inserted on the head. Pappus of two small, separable, cup-like scales, each bearing a single row of stiff bristles.

Relationships.—The obliquely lateral insertion of the fruit reminds one of the Cynareae-Centaurineae, from which the plant differs widely in other respects. The character of the bracts and the homogamous inflorescences suggest the Gnaphaleae, but the anthers have rounded bases and no tails.

The slight resemblance to a young stage of Bartlettia (Senecionideæ) is of no importance, since this plant has female ray florets and differs in the pappus and unstalked achenes. Among the Asterae-Solidaginae the genus shews a certain degree of relationship to Lessingia, but the florets are all alike, the outer ones not being more deeply slit on the outside. The general habits and leaves are like those of Achnophora tatei, F. v. M., which would bring the plant between Calotis (Asterae-Asterinae) and Brachycome (Asterae-Bellidinae). The plant differs, however, in the pappus, stalked achenes, and absence of ray florets, and among the Asterae-Bellidinae only one species of Greenella has homogamous heads. The general characters agree best with the Asterae-Asterinae, although the genus shewn also approaches to the Solidagineae and Bellidinae sections, and also through the bracts to the Anthemideae.

BELLIDA GRAMINEA, n. sp. Jibberding, W.A., 1905, M. Koch.

A small tufted annual herb, from 6 to 18 cm. high when in fruit, and with a short slender tapering tap root. Leaves radical in a grass-like tuft, unstalked, flat, linear, contracted to an obtuse tip, 2 to 7 cm. long, about 1 mm. broad, glabrous, or occasionally with a few small scattered hairs, chiefly at the margins. All other subaerial parts glabrous excepting the fruit. Flower heads conical with a rounded top, on separate stalks, the outer ones curved, longer than the leaves (6-18 cm.), arising at the top of the root among the leaves. A single linear bract about 2 mm. long with scarious edges is usually, but not always, present an inch or two below the head, but sometimes near the base and then easily overlooked.

Inflorescence of 40 to 50 small yellow tubular hermaphrodite florets (no rays), surrounded by a double set of scarious bracts, the outer series smaller in 2 imbricate rows of 6 or 7 in each, the inner layer with 7 or 8 in each row, and with broad overlapping scarious margins, and a central dark line usually projecting as a point at the tip. The young flower heads are about ½ cm. diameter, but enlarge to 1½ or 2 cm. diameter in fruit, the bracts, especially of the inner set, doubling in size.

Florets about ½ cm. diameter, with a slender ovary but no stalk and no scales between. Corolla tubular, with 5 regular free points, and the appendices of the anthers projecting beyond them. The slender style is bifid, with conical or truncate ends papillose on the outer side, the stigmatic lines on the edges of the bifid portion within the anther-tube. Pollen grains globular and minutely spiny. Fruits 1 cm. long or more, the achene contracted to a short stalk at its base, which is hollow and has an oblique basal opening below one edge of the flattened achenial part of the fruit. The sides of the achene are finely sculptured with transverse grooves, and bear a pair of small brown scales, whose upper margins are drawn out into a fringe of stiff bristles ½ to 1 cm. long, themselves fringed with minute teeth, the upper two-thirds bright pink, the basal third white.

BURTONIA MULTIJUGA, F. v. M., Forrest's Expedition = Burtonia polyzyga, Benth., var. multijuga, F. v. M. (Leguminosae).

The specimens are rather larger, coarser and stouter than the type species, which they otherwise closely resemble. The hairs are shorter forming a dense but thin woolly covering. The leaflets average 30 in number, and vary from 3 to 6 mm. in length, and from 2 to 4 mm. in breadth. The common petiole usually averages 6 to 8 cm. in length. The specimens bear no flowers, and from the other characters can only be classed as a variety of B. polyzyga, Benth.

CALOTHAMNUS GILESII, F. v. M. Watheroo sandy plains, W.A., M. Koch, 1906.

Of this rare plant described in 1876 (Fragmenta X., p. 31), the Herbarium only possessed two fragmentary specimens without any fruits. These are usually in close sessile clusters of 2 to 5, nearly cylindrical, greyish-brown to buff colour, 2 of the persistent calyx teeth often growing larger than the others in old fruits, which attain a height and breadth of 1 cm. The fruits open by 3 valves within the cup. The linear seeds are angular without any perceptible wing, usually slightly curved, numerous, light to dark brown, and just exceed 1 mm. in length.

COMMERÇONIA REDUCTA, F. v. M. and Tate, M.S. (Sterculiaceae), (Dec, 1887, Port Lincoln) = C. Tatei, F. v. M., Trans. Royal Society S. Austr., x., 1888.

The description here given is insufficient to identify either plant. but specimens of C. Tatei, obtained from Adelaide, are identical with those named C. reducta in the National Herbarium, the former name standing.

CONOSTYLIS ACULEATA, R. Br., var. bromelioides (C. bromelioides, Endl.). M. Koch, Cowcowing, 1904; Jibberding, W.A., 1905.

Specimens from these localities show all stages of transition between C. aculeata and C. bromelioides, some specimens having the inflorescence of C. aculeata with the leaf of C. bromelioides, others the leaf margin of C. bromelioides, with the number of flower bracts and length of leaf of C. aculeata. The distribution seems to preclude the formation of hybrids, and hence Bentham's suggestion[1] that C. bromelioides might prove to be a variety of C. aculeata is confirmed.

CONOSTYLIS AUREA, var. longiscapa, n. var. M. Koch, Jibberding sand plains, W.A., 1905.

Scapes (14-18 cm.) longer than the leaves (10-14 cm.). Leaves narrow, barely more than 2 mm. diam. (instead of half a cm.). In this respect the specimens approach var. humilis, F. v. M., but the marginal setae are finer and more hair-like. A doubtful specimen from the Murchison R. has the same characteristics as this variety, but the bracts are much longer both on the scape and in the flower head.

CROTALARIA MITCHELLI, Benth, var. tomentosa, new var. (Leguminosae).

Between Finke River and Charlotte Waters, Kempe. Densely covered with fine hairs in every part except the corolla and fruit.

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[1] Flora australiensis, vol. vi., p. 438.

Smaller leaves and fewer flowers than the type species. Axis of inflorescence 3 to 5 cm long, instead of 10 to 15, leaves rarely more than 2½ cm long by 1½ broad, instead of 5 to 10 cm long. In other respects the specimens resemble C. mitchelli, and differ from C. retusa in the flower, fruit, leaves and number of ovules

DAVIESIA MESOPHYLLA, n. sp ?

This plant, of which flowering specimens were obtained from W. and S. W. Australia, is closely allied to D. microphylla, but differs from it in several important respects. It is a small glabrous shrub without thorns, the branches striate with raised lines. The leaves are stout and rigid, vertical, laterally compressed, with thickened edges, usually convex on the lower, and concave on the upper edge, lanceolate or nearly linear, but contracting slightly at base, and converging to a sharp point at the apex, usually 1 cm. long, but varying from 6 to 12 mm., 1 mm or slightly more broad. In transverse section the two marginal veins are larger and have more prominent bands of sclerenchyma than the median pair, which fuse to one along the basal third of the leaf. The leaf has a complete peripheral double layer of assimilating tissue, of which the inner layer is darker and tanniferous. In respect to their microscopic structure the leaves of D. mesophylla and D. microphylla show a close similarity. The flowers are in lateral leafy racemes, either crowded in rather slowy clusters of 8 to 12 flowers, on short branches, or sparsely scattered on longer, more leafy ones. The flowers are 8 to 10 mm. long and arise in the axils of the phyllodes on pedicels 5 to 7 mm long, usually with 4 minute bracts at the base of the pedicel, of which the uppermost is about 1 mm. long, boat-shaped, curved, and projecting from the pedicel. The three pointed anterior teeth of the calyx are nearly 1 mm. long and about ⅓ the total length of the calyx, the two posterior are fused, with blunter lobes, the dividing notch being ⅓ the depth of the others. Petals as in D. polyphylla, fruit not seen.

The plant is distinguished from D. microphylla by the larger leaves, flowers and bracts, by the longer pedicels, the more prominent calyx teeth, by the absence of the spiny terminations to the branches, and by the occurrence of the flowers in clusters, They may however also be solitary, and one specimen exhibits both characteristics. Bentham in fact suggested that the solitary flowers of D. microphylla might not be a constant feature, and a specimen named by Bentham D. microphylla, but originally named D. incrassata, Sm., has leaves approaching closely to those of D. mesophylla. Unfortunately Bentham's specimen has no flowers, hence it can not at present be definitely determined whether we are dealing with a strongly marked variety D. microphylla or with a recently evolved species, still connected to the parent type by intermediate forms.

DAVIESIA ULICINA, Smith, var. subumbellata (Leguminosae). Victoria desert, Elder Expedition, R. Helms, 1891.

Not previously recorded from W. Australia.

DODONAEA ADENOPHORA, Miq., var. ovata, n. var. (Sapindaceae).

Specimens were sent, in 1884, from Adelaide by J. H. Brown to von Mueller, and laid aside for future examination. The specimens have a very different superficial aspect to the type specimen of Miquel with which, however, they agree in all essential features. The leaves differ in having a larger number of leaflets, commonly 11; the leaflets are relatively broader (usually 3 mm. long by 1 broad), more regularly arranged and more ovate, and hence the plant may be distinguished as variety ovata.

DRYANDRA FRASERI, R. Br. Watheroo sand plains. W. Australia. Max Koch, Aug. 1906,

The only specimens previously in the Herbarium were those examined by Bentham.

ERIOSTEMON BRUCEI, F. v. M. M. Koch, Cowcowing (Victoria district of S. W. Australia), 1904.

Very rare.

ERIOSTEMON TUBERCULOSUS, Benth, var. megaphyllus, n. var. Cowcowing, 1904.

Leaves distinctly bi-lobed at their apices, and averaging 15 mm. by 3 mm. (10 to 20 mm. long, and 2 to 4 mm. broad). Short narrow petioles from 2 mm. to 1 mm., or less in length, but always more distinct than in type species. Other specimens have progressively smaller leaves, some bi-lobed and some not, forming intermediate conditions between this variety, the type species, and even var. microphyllus, which have otherwise very distinct aspects, and of which the latter form was recognised by Bentham as a distinct species (Phebalium microphyllum), but as a variety by Mueller. The variety microphyllus has the leaves shortly stalked, but not bi-lobed at the apex, and smaller and narrower than the variety megaphyllus.

ERIOSTEMON (PHEBALIUM) INTERMEDIUS, n. sp.

This plant is interesting since it forms a connection between the Leionema section and Eriostemon proper, thus justifying von Mueller's inclusion of Phebalium in Eriostemon.

Leaves 2 or more cm. in length, usually 2, nearly linear, tuberculate with small glands, narrowed at the base to a stalk, pointed at the apex, but the point not curved. Channelled above, rounded below, no midrib shewing, and less than 1 mm. diam. at the broadest part. Sepals very small (about ½ mm. long), spreading, green or brown, rather obtuse or slightly pointed, edges entire or fringed with extremely minute hairs, and bearing a few small, slightly-projecting glands. Petals 5, white, narrowed near their bases, and 3 to 4 mm. long. Stamens 10, with minute white or no appendices, the filaments not hairy or ciliate, with broader flattened bases. Base of the ovary with a thickened disc, and each coccus of the fruit containing one rather large, flat, brown, apparently-winged seed, about 2 mm. in length.

Cowcowing, M. Koch, 1904; W.A., between Upper Blackwood R. and L. Lefroy, Miss Cronin, 1893.

The latter specimens were placed by von Mueller with E. Brucei apparently from superficial examination only, since the plants are readily distinguished from that species by the longer leaves not recurved at their tips, by the smaller sepals not perceptibly broader at their middles, and ½ mm. long instead of 1 mm. or more, by the filaments flattened at their bases and not ciliate, by the less distinct appendix, and by the style being not short but about ½ the length of the petals. The species resemble one another, however, in general habit, in the flowers solitary in the axils of the leaves, on pedicels of about 2 mm., with the bases surrounded by minute bracts. From E. scaber it is readily distinguished by the absence of any articulation of the pedicel to a peduncle, and from E. linearis by the stigma being entire and not lobed.

EUPHORBIA HYPERICIFOLIA, L., var. bracteolaris, Boiss (Euphorbiaceae). Elder Exploring Expedition, 1892, lat. 27 deg. 5 m. S., long. 119 deg. 15 m. E.

This plant was considered by Luehmann to be a new Australian species. Specimens sent to Kew were determined as E. indica, L., from which the plant differs only in the seeds being smooth instead of shallowly pitted. E. indica, L., is probably an error, for E. indica, Lamk., which is placed under E. hypericifolia as var. indica by Hooker; variety bracteolaris has the smooth seeds of our specimens, and agrees in other respects within a varietal range. The species is new to Australia and undoubtedly indigenous.

LEPIDOPETALUM (Bl.) TENAX, Benth.

Specimens of Lepidopetalum australis, F. v. M., MS., collected by Hill at Moreton Bay, were sent to Kew and returned marked, "genus correct, species not at Kew." On further examination they were found to be identical with specimens named Ratonia tenax, Benth., by Bentham himself, and from the same locality and collector. The species, therefore, becomes Lepidopetalum tenax, Benth., for which Cupania tenax, A. Cunn., Ratonia tenax, Benth., and Lepidopetalum australis, F. v. M., are synonyms.

LEPYRODIA SCARIOSA, R. Br. (Restiaceae). Grampians, H. B. Williamson, 1903.

New to Victoria.

MELALEUCA CORDATA, Benth., var. ovata, F. v. M. M. Koch, Western Australia.

These specimens with almost oblong leaves, all regularly 3-nerved, diverge more strongly from the type species than those on which von Mueller's variety was founded. The leaves on the latter have mostly 5 nerves, and only a few smaller ones have 3.

MYRSINE (RAPANEA) BENTHAMIANA, Mez. 1884, Port Darwin, M. Holtze.

Named at Kew, and not previously recorded for Australia.

NEPHELIUM BECKLERII, Benth., var.? (Sapindaceae). Logan R. Scortechini.

The leaflets are smaller than the type, averaging 7 cm. by 2, and the venation finer. New to Queensland.

PERSEA BAILEYANA, F. v. M. Ined. (Lauraceae), given in Bailey's Flora of Queensland, p. 1310.

The specimens in the National Herbarium are marked "probably Cinnamomum Tamala, Nees," in the handwriting of von Mueller, and queried as Cinnnamomum virens, R. T. Baker, by R. T. Baker. One specimen of C. virens is marked by R. T. Baker as very close to C. propinquum, Bailey, which Bailey considers to be closely allied to C. ovalifolium, Wight, Ic. 125. A type specimen of C. propinquum, Bailey, agrees closely with the figure of C. albiflorum, Nees (Laurus cassia, Roxb.) in Wight, Icones 140, and this species is an accepted synonym for C. Tamala, Nees. This disagreement of experts probably results from the fact that all these "species" are so closely connected with C. Tamala by intervening forms as to render it advisable to extend the boundary of this species so as to include C. virens, Baker, C. propinquum, Bailey, and C. oliveri, Bailey, of which plant we have specimens from the same locality (Lismore) as C. propinquum. In any case there appears to be no justification for the name Persea Baileyana, F. v. M., as a MS. name on the authority of Baron von Mueller.

PETROPHILA ERICIFOLIA. (Proteaceae). Jibberding. M. Koch.

Intermediate forms resembling var. glabriflora in their smaller leaves and smaller cones, but with a hairy not glabrous perianth, in this respect resembling var. scabriuscula.

RICHARDSONIA STELLARIS, Cham. et Schlect.

Specimens were found in the Herbarium sent in 1885 by Betche from Mossmann's Bay, N. S. Wales, with a letter by von Mueller addressed to Kew but never sent. On reference to Kew the plant was determined as above, the species being from S. America, and evidently an introduced weed to N. S. Wales, where R. humistrata is already recorded as an introduction.

ROMULEA (TRICHONEMA) CRUCIATA, Ker-Gawl (= R. cruciata, Eckl.).

This widely-spread Irid with rose-lilac flowers, and tough grass-like leaves is commonly known as the Guildford grass or Onion grass, and was originally referred by F. von Mueller as R. bulbocodium, L. It is given in Rodway's Flora of Tasmania as R. rosea, a S. African plant. Both these species, however, have the style longer than the stamens, whereas our plant resembles the R. cruciata, distinguished by Ker-Gawl. (Bot. Mag., 1802, pl. 575) from R. bulbocodium, and R. rosea, by the style shorter than the stamens and the hairy filaments. Baker, in the Flora Capensis, makes this species R. longifolia, Baker, but the three purple stripes on the outer perianth segments given by Baker are absent or very feebly developed, and the spathe segments are smaller (½ cm. long in flower to 1 cm. in fruit), the inner segment having a broad scarious margin. The leaf, as in the type specimens of R cruciata, often has a fifth groove on one edge for a portion of its length, giving the appearance in transverse section shown in Plate XII. (a). Otherwise the transverse section (b) resembles that of R. rosea (d) more closely than that of R. bulbocodium (c), whereas the transverse section of the leaf of a type specimen of R. cruciata, closely resembles that of R. bulbocodium This fact and the character of the spathe segments justifies the recognition of an Australian variety of R. cruciata.

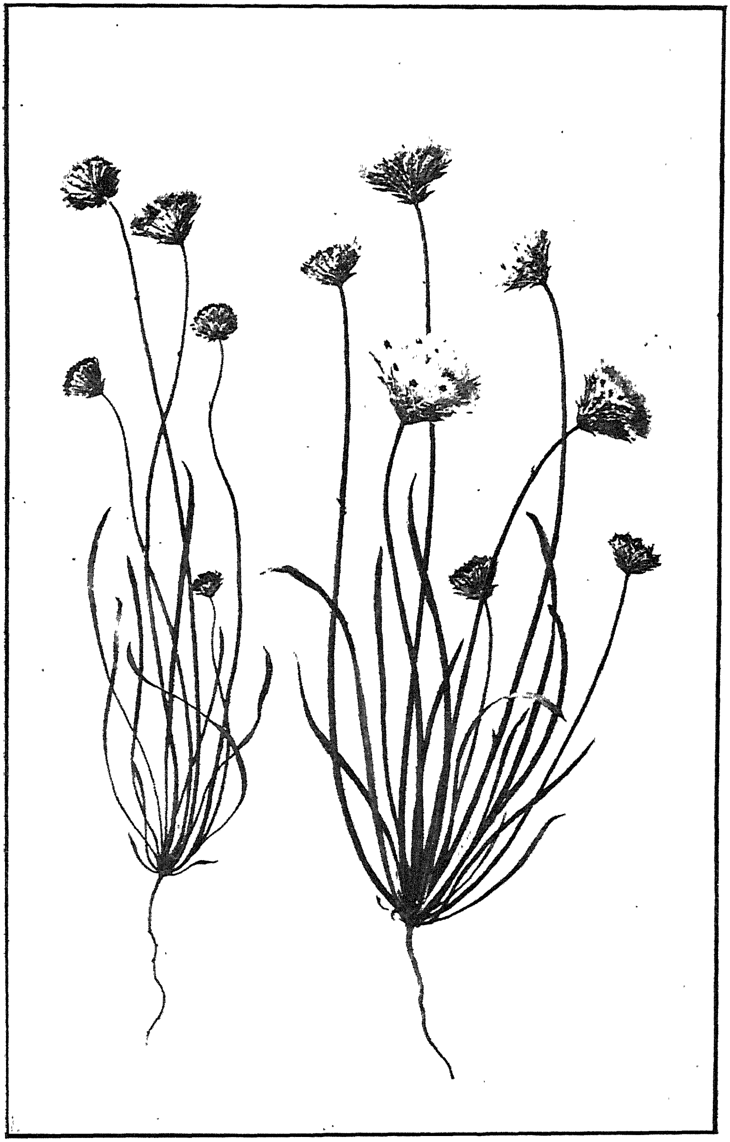
There can be no doubt that the short style with its six very short stigmatic arms, which separate as the stamens shed their pollen, is an adaptation for self-pollination. The flowers, which are strongly thermonastic, only open on warm sunny days, and do not seem to have any regular insect visitors. The plant grew abundantly in the neighbourhood of the Botanic Gardens over 40 years ago, and may date much further back still, for its increase is favoured by the conditions attendant on the presence of civilized man. Probably if specimens had been collected from the early part of last century, we would have received evidence of adaptive modification on the part of this plant, but whether R. cruciata, var. australis, is derived from R. bulbocodium or R. rosea is impossible to say. In any case the whole genus of Romulea is badly in need of revision.

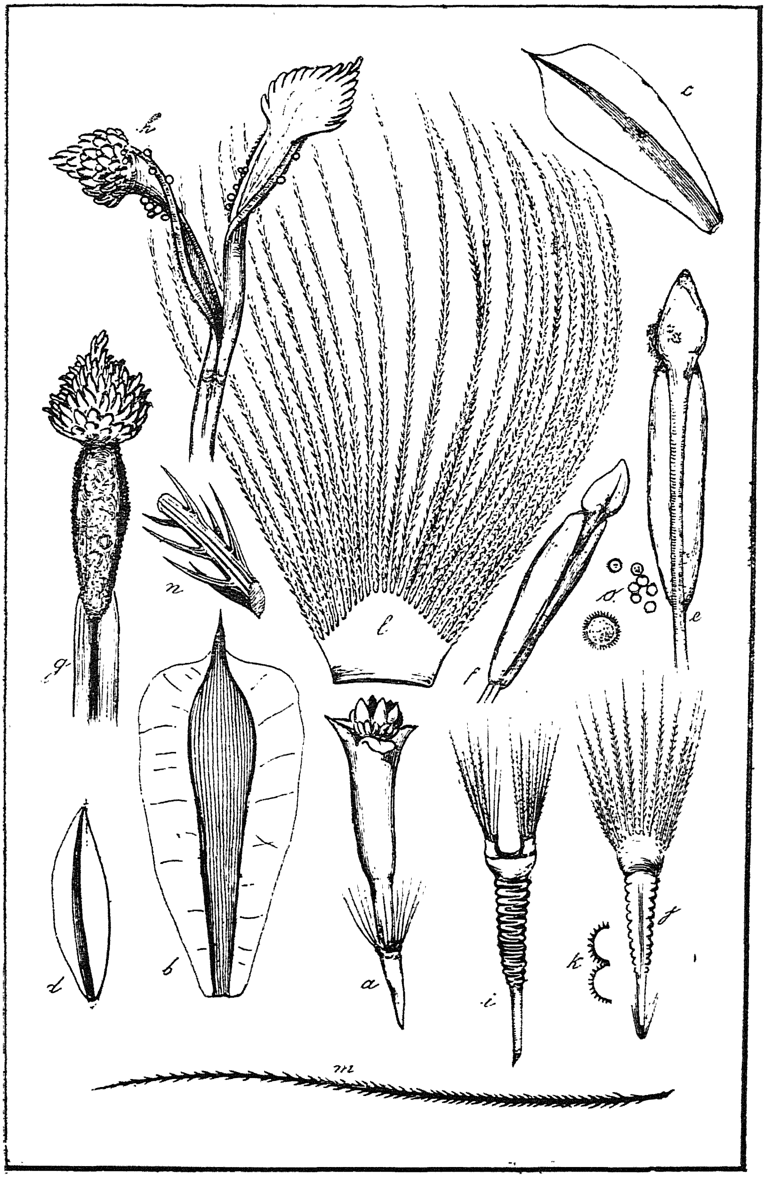
Experiments on the extermination of this weed are in progress at the Herbarium and in the Domain grounds. The use of pigs has been suggested to root out the corms from the ground, and Mr. T. S. Hall has recorded before the Field Naturalists' Club that white cockatoos coming North from the Otways have performed the same office, and by digging out the corms have cleared patches of ground infested by the weed. Mr. C. French, Jun., reports that he has often seen children eating the bulbs, although to the novice the taste is by no means pleasant. A quantity of the corms crushed and washed through a fine sieve yielded on settling an abundance of fine-quality starch, so that, were it not for the expense of collecting the bulbs, they might form a profitable source of starch. The seeds are also highly nutritious, and it is owing to the sparrows and other birds which eat the seeds that the plant is so rapidly and widely spread. Future investigation may show some use for the seeds. The stalk of the fruit capsule is strongly geophilous, and curves down towards the ground during ripening. In loose ground it is sometimes partially or completely covered before the seeds are shed.

SCAEVOLA LACINIATA, Bailey. Flora of Queensland.

This plant resembles the variety pallida of S. microcarpa in the glabrous style and the corolla nearly glabrous outside, but has the larger flowers of the type species and the leaves somewhat more cut. It can only be classed as a variety laciniata, Bailey, of S. microcarpa, intermediate between the type species and variety pallida.

Scaevola scandens, Bailey, Flora of Queensland, seems to resemble S. enantophylla closely in all specific points except

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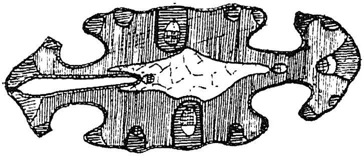

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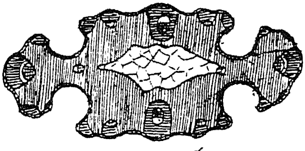

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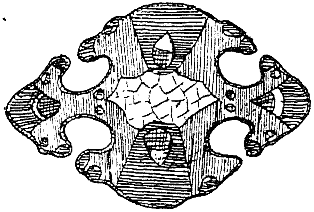

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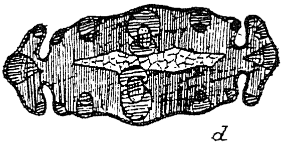

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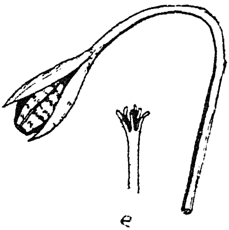

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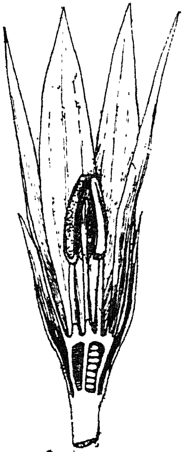

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as regards the climbing habit, which a straggling plant of this character may easily develop in a shady situation. Since not more than one or two specimens seem to be in existence, the plant can only be classed as a variety of S. enantophylla, F. v. M. (var. scandens, Bailey), until more material is available.

TINOSPORA WALCOTTII, F. Muell., Herb. = T. smilacina, Benth. (Menispermeae).

The only reference to this plant in the Fragmenta IX., p. 83, 1875, is that it is possibly a variety of T. smilacina. The specimens in the Herbarium are in leaf only and are imperfect, but the leaves vary from the shape characteristic of "T. Walcotti" (cuneate base, etc.), to the normal cordate shape of T. smilacina on one and the same specimen. It is more than doubtful, therefore, whether this plant even forms a distinct variety of T. sinilacina, Benth., and though it was retained in the census, von Mueller evidently had doubts as to its validity.

EXPLANATION OF PLATES X., XI., XII.

X.—Bellida graminea.—Plants slightly reduced.

XI.—Bellida graminea —(a) floret; (b) one of the inner bracts; (c) and (d) two of the outer bracts; (e) and (f) stamen, with (o) pollen grains, one magnified strongly; (g) and (h) style with marginal stigmas and terminal papillae; (i) and (j) side and back view of stalked achenes with (k) two of the lateral ridges magnified; (l) one half of the pappus, and (m) one hair of the pappus magnified, and (n) a portion of a pappus hair highly magnified.

XII.—Romulea.—(a) Transverse section of leaf of R. cruciata, var. australis, through lateral groove; (b) through middle of leaf; (e) stigma and fruit; (f) long. section of just opened flower; (c) transverse section leaf Romulea bulbocodium; (d) transverse section leaf Romulea rosea.

[Proc. Roy. Soc. Victoria, 19 (N.S.), Pt. II., 1906]

Art. VII.—*Note on Caligorgia flabellum from Port Phillip.*

By Professor SYDNEY J. HICKSON, D.Sc., F.R.S.

[Read 11th October, 1907.]

In the Proceedings Royal Soc. Victoria, Vol. II., 1890, p. 138, I gave the name Primnoella australasiae, Gray, to a specimen belonging to the Alcyonarian family Primnoidae, obtained by Mr. J. B. Wilson at Port Phillip. Mr. J. Versluys, of Amsterdam, has examined a fragment of the colony that is still in my keeping, and informs me that the species is more closely related to Caligorgia flabellum of Ehrenberg. I have carefully re-examined the specimen with the help of Mr. Versluys's recent memoir on the Primnoidae of the Siboga Expedition, and I am convinced that his opinion is sound. I ask therefore to correct my report by substituting the name Caligorgia flabellum (Ehrenberg) for Primnoella australasiae (Gray), in the list of species obtained at Port Phillip.

[Proc. Roy. Soc. Victoria 19 (N.S.), Pt. II., 1906.]

Art. VIII.—*Four New Echinoids from the Australian Tertiary.*

By T. S. HALL, M.A.,

University of Melbourne.

(With Plates XIII.-XVI).

[Read 13th December, 1906].

The present paper contains descriptions of

Echinoneus dennanti, n. sp.
Prenaster aldingensis, n. sp
Brissopsis tatei, n. sp.
Schizaster sphenoides, n. sp.

Advantage of the opportunity has been taken to figure and re-describe Schizaster abductus, Tate, which was not very fully diagnosed by the author, and was not illustrated.

All the species are of Barwonian age, that is, belonging to the oldest of our Tertiary series.

Echinoneus dennanti, n. sp.

Test elongate, slightly wider just behind the apical system. Flattened dorsally and actinally, depressed, with a thickly rounded ambitus. Of the four genital openings the posterior lateral pair are slightly the largest and are separated by about their own width.

Ambulacra similar, flush, continuous from apex to peristome, broadest at the ambitus. Poriferous zones narrow, straight, not sunken. Pairs of pores very numerous. On the abactinal surface a line joining the pores of each pair is normal to the length of the zone. Towards the ambitus and actinally this line becomes more and more oblique, so that near the peristome the pores tend to, but do not quite, become arranged in a single linear series, the pores of each pair being closer together than those of the next succeeding pair.

Peristome large, triangular, and showing the curious obliquity of the genus. Periproct large, long, oval, pointed at the posterior end.

Tubercles sunken, crowded, imperforate. There do not seem to be any of the generically characteristic tubercles of epistoma, the spaces between the tubercles being smooth. This, however, may possibly be due to weathering.

MEASUREMENTS.

Length, 21. Breadth, 14. Height 7.

The genus has not been previously recorded from our older tertiary. It ranges from the Miocene in the West Indies, and there are two very widely-spread recent species.

Locality.—"Filter Quarries," Batesford, one specimen somewhat obliquely crushed, and a fragment. Barwonian (? Eocene).

Prenaster aldingensis, n. sp.

Test small, oval, tumid, posteriorly truncated, flattened actinally, Apical system small, excentric in front. Peristome transverse, slightly crescentic in front (damaged posteriorly). Ambulacra in extremely faint depressions near the apical system, the depressions only noticeable in oblique light. At about two mm. from the apex the ambulacra have become flush. Pores minute, round, the pairs about their own width apart. Ambulacra narrow, straight, open. Towards the ambitus the pores of the odd ambulacrum are elongate slits, very far apart. Actinally, round the peristome the pores are also slit-like.

Periproct high on the posterior truncation ; as far as can be seen, it is large and pointed at its uper end.

Primary tubercles very small, perforate, crenulate, scrobiculate. They are sparsely scattered over the dorsal surface. There are four rather large ones at the apex, which are apparently close to the outer sides of the basal pores. The tubercles are larger dorsally on the anterior ambulacra, and also actinally, near the ambitus. The sternum is hidden by matrix. There is a faint ridge bounding the scrobicular areas, which are not sunken. Actinally the tubercles are excentric anteriorly on the scrobicular areas. Outside the scrobicules is in most cases a single row of miliaries forming a ring, and a few scattered miliaries occur as well.

Only one basal pore is visible, and that doubtfully. It is the right posterior lateral, and is close to the inner side of a large primary tubercle, as above mentioned.

The madreporite is long and narrow and separates the posterior basals and radials, as well as the right anterior radials. The radial pores are as large as the ambulacral pores, and are five in number.

The fascioles are very narrow and consist of two close-set rows of miliaries. The peripetalous is slightly pointed posteriorly in the posterior interradius. Anteriorly it disappears before reaching the antero-lateral ambulacrum, and it is uncertain whether it joins the marginal. The marginal fasciole dips below the ambitus anteriorly, and runs close to it in front of the peristome. As the posterior truncation is hidden by matrix its course here is not visible.

MEASUREMENTS.

Length, 21. Breadth, 18.5. Height, 14.
Distance of front edge of peristome from anterior, 5 mm.
Width of posterior lateral ambulacrum near fasciole, 1.5.
Length of anterior lateral petal, 6.
Length of posterior lateral petal, 5.5.

The genus is typically Eocene, but ranges into the Miocene in Europe, one species, P. excentricus, Wright, occurring in the Tortonian of Malta.[1] The present species is very unlike it, judging by Dr. Wright's figure[2] and description[3].

The genus is new for our tertiaries.

Locality.—Aldinga (Barwonian, ? Eocene). A single specimen collected by Mr. R. H. Cummins, B.Sc.

Brissopsis tatei, n. sp.

Test thin, broadly ovate, depressed. Vertex about a third of the length from the posterior end. Apical system nearly central. Ambulacra sunken. Anterior groove broadly indenting the ambitus. Lateral ambulacra curved. The antero- and postero-lateral of the same side forming a segment of a circle, the

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[1] Gregory, J. W., Trans Roy. Soc., Edinburgh, 36 (1891), p. 630.

[2] Q. J. G. S., 20 (1864), pl. 22, fig. 3.

[3] Ann. Mag. Nat. Hist., s. ii., vol. 15 (1855), pp. 195, 196.

segments of the opposite sides touching at the apex. The outer ends of the postero-laterals are half the distance apart that the outer ends of the antero-laterals are. Actinally the ambulacra are broad and bare. Peristome crescentic. Labrum not prominent.

Peripetalous fasciole crossing the anterior groove at about half the diameter of the test from the apex. It runs back parallel to the groove for about 8 mm., and then bends out to the outer end of the antero-lateral petal. Thence it curves inwards following the curve of the petals, and between the outer ends of the posterior petals is straight. Its form is almost exactly that figured by A. Agassiz for B. lyrifera in his "Revision" (pl. xix., fig. 9). The subanal fasciole is concave above. The presence of an anal branch is doubtful.

There are four perforate basals.

MEASUREMENTS.

	Length.	Breadth.	Height.	Post lat. petal.	Ant. lat petal.	Apical Syst from Anterior.
1.	46	41	24	6	6	27
2.	47	41	23	–	7	27

The fine calcareous matrix is closely adherent to all the numerous specimens before me, and many are crushed and broken.

Professor R. Tate has recorded Toxobrissus sp. from our Older Tertiary. This is a synonym of Brissopsis, and the record perhaps refers to the present species.

In the curvature and mutual relationships of the ambulacral petals and in the shape of the peripetalous fasciole, the affinities of the present species are not with such an Eocene form as the Sindian B. sufflatus, Duncan and Sladen, but rather with the existing B. lyrifera and B. luzonica, and more especially with the latter. From it, however, it is distinguished by the closer approximation of the outer ends of the postero-lateral petals and by its more broadly oval form and less pointed posterior end. It also closely resembles B. crescenticus, Wright, from the Malta Oligocene, but is easily separable by the closer approximation of the posterior petals posteriorly, and by the greatest width being behind the apical system, and not in front of it.

Locality.—Cliffs at mouth of Sherbrooke River (type), and at various localities along the coast in the neighbourhood. Also a cast from the clays of Grice's Creek. Barwonian (? Eocene).

Schizaster sphenoides, n. sp.

Broadly ovate, depressed, somewhat pointed posteriorly. Anterior groove indenting the ambitus to a depth of about 8 mm. in specimens the size of the type. Dorsal surface rising steadily to the vertex which is on a rather sharp median keel, and about one-third of the total length from the posterior end.

Lateral petals in rather deep grooves; the anterior laterals at first curved and then straight. The posterior straight, lanceolate, and very short. Odd ambulacrum in a deep groove, 6 or 7 mm. deep in specimens the size of the type, with a flat floor and overhanging edge, so that the paired pores are not visible from above.

Sternum flat, lanceolate, followed posteriorly by a pair of tumidities, between which a shallow groove runs up to a subanal concavity. Hind end truncate, overhanging above, the oval periproct near the summit of the truncation. Peristome, lunate, visible from the front, with a well-developed labrum. Actinally the posterior lateral ambulacra are on broad areas that slope strongly up to the ambitus medially and posteriorly.

There are four perforate basals. Tubercles larger on the sternum, and crowded; not so crowded, but as large on the other interambulacra actinally. Small on the dorsal surface.

Peripetalous fasciole crossing the anterior sulcus, in specimens the size of the type, at about 5 mm. from the ambitus; thence straight to outer end of anterior lateral petal. A deep re-entering angle between the antero- and postero-lateral petals, and straight between the posterior petals. Lateral fasciole given off from the peripetalous at about a quarter of the length of the anterior lateral petal from its outer end, crossing the ambitus at about 10 mm. from the periproct, and passing below it at about the same distance.

MEASUREMENTS.

	Length.	Breadth.	Height.	Antero-Lateral Petal.	Postero-Lateral Petal.
1.	66	60	38	25	7.5
2.	66	60 ? (damaged)	35	24	8
3.	48	47	23	18	6.5

(No 1 is the figured specimen.)

Locality.—Base of cliffs at mouth of Sherbrooke River, common, but usually crushed. Associated with Eupatagus laubei, Maretia anomala and Brissopsis dennanti. At a higher level Lovenia forbesi is common, but I have not found it below. Most of the specimens in the lower bed have patches of spines still attached. These and the matrix adhere very closely, and I have not been able to clear them with the dental engine. Exposed portions are usually sandpolished by the action of the surf. Barwonian (? Eocene).

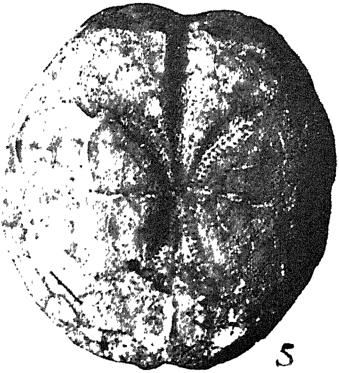
Schizaster abductus, Tate.

1891. Tate, Tr. and Proc. Roy. Soc. S. Australia, p. 281.

Tate's description consists mainly of a comparison of the species with S. australis, Gray, and is unaccompanied by a figure

A specimen in my collection from the type locality, Morgan, given me by Master Frank Cudmore, is in a much better state of preservation than Tate's two examples, the larger of which is the type. For the loan of these I have to thank Mr. W. Howchin, F.G.S., actual comparison being necessary for identification.

The species is broad-ovate, pointed posteriorly. In lateral view the dorsal surface rises regularly from the anterior end to the vertex, which is on a median ridge, two-thirds of the distance between the apex and the posterior end. Base slightly tumid. Subanal area vertical. Periproct its own height below the top of the overhanging posterior projection and visible from below. Anterior ambulacrum in a deep groove which only slightly indents the ambitus. Lateral petals in grooves as deep as that of the anterior ambulacrum. Anterior lateral at first widely diverging and then running forwards at about 40 deg. with the mid-dorsal line. Their length slightly less than one-third of the transverse diameter. Length of posterior petals about a fifth of the transverse diameter of the test. Less divergent than the anterior ones. Peristome lunate, posterior lip prominent. Peripetalous fasciole crossing the anterior ambulacrum at a distance from the apex equal to the semi-diameter through the apex. From here it runs with a scarcely perceptible re-entering angle to the anterior lateral petal. Between the lateral petals it forms a deep re-entering angle, keeping close to the edges of the



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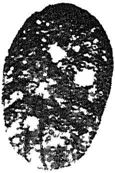

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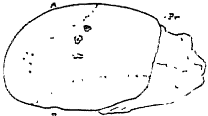

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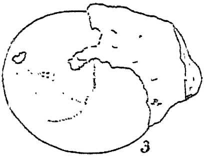

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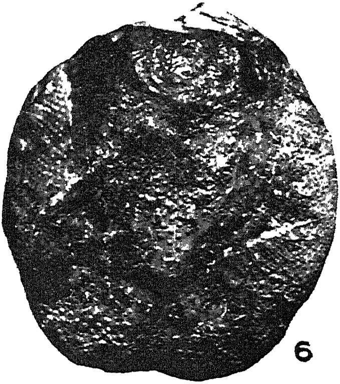

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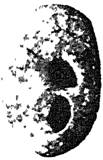

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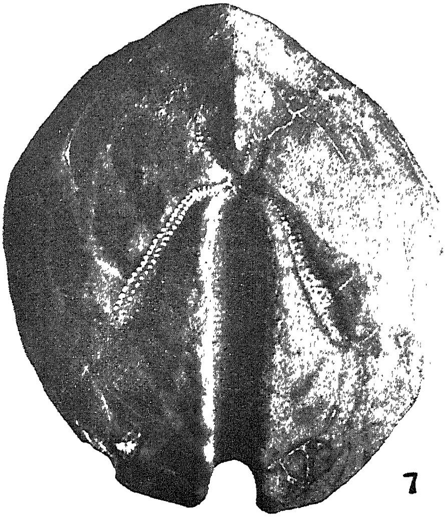

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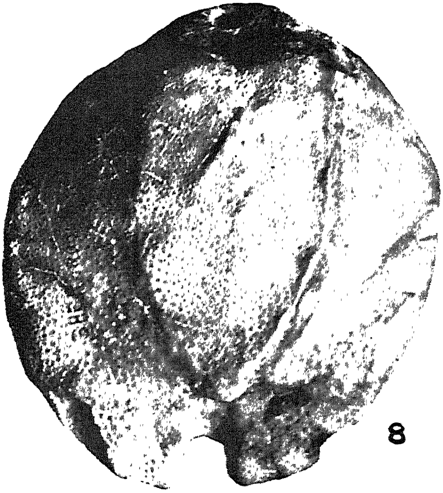

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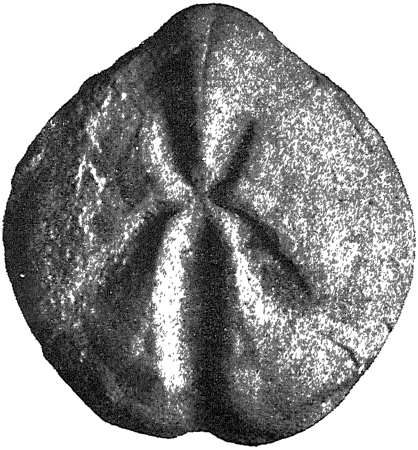

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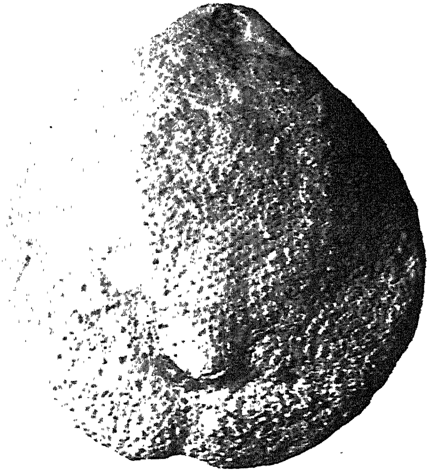

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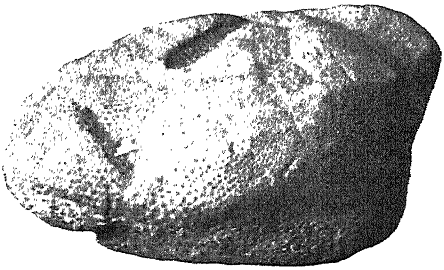

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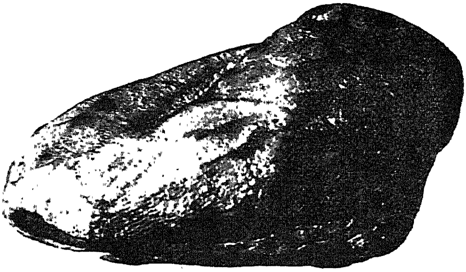

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grooves Between the posterior petals it is almost straight. The lateral fasciole leaves the peripetalous at about one-third of the length of the anterior lateral petal from its outer end, and keeps well on the dorsal surface till opposite the outer end of the posterior petal, when it bends downward to pass under the periproct at a distance below it equal to the length of the posterior petal. There are four perforated basals

MEASUREMENTS

	1	2	3
Length - -	58 (damaged)	48 -	61
Breadth - -	55 -	45 -	56
Height - -	35 -	28 -	35
Post lat. petal -	13 -	8 5 -	12
Ant. lat petal -	20 -	15 -	20

1 Tate's type, 2 his smaller specimen; 3 the author's specimen All from Murray River cliffs at Morgan. No 3 is the figured specimen

I have specimens of what I believe to be this species from Table Cape and Spring Creek, but both are somewhat crushed. Mr. J Dennant also has the species from Table Cape.

EXPLANATION OF PLATES XIII.-XVI.

Figures 1, 2.—Echinoneus dennanti, n sp. Slightly obliquely crushed

„ 3, 4.—Prenaster aldingensis, n. sp. Outline sketches showing fascioles. A., apical system. Ps., peristome. Pr., Periproct

„ 5, 6.—Brissopsis tatei, n. sp.

„ 7, 8, 12.—Schizaster sphenoides, n. sp. Slightly distorted.

„ 9, 10, 11.—Schizaster abductus, Tate.

All the figures are about natural size.

[Proc. Roy. Soc. Victoria, 19 (N.S.), Pt. II., 1906.]

Art. IX.—*Surface Tension as an Aid in Canyon Formation, the production of Bad Lands, and in River Capture.*

By J. A. LEACH, M.Sc.

(With Plate XVII).

[Read 13th December, 1906].

Being attracted by a statement made by Professor Miall that the surface film of water was a veritable death-trap to many small animals, my thoughts turned much to phenomena connected with that remarkable film.

This statement was soon seen to be true, mosquitos, water-fleas (Daphnia), and many small pond animals have been seen held close prisoners by this wonderful "top of the water." Other animals, such as mosquito larvae and pupae, pond snails, hydra, etc., were seen, however, to take advantage of it.

It is well known that soap bubbles are due to this phenomenon, while the sphericity of rain-drops is also caused by its action. The necessity of droppers for medicine, of lips and spouts for jugs, teapots, and other vessels is also due to the tendency of this surface film to adhere to any body it might happen to wet. This tendency to adhere instead of falling vertically downward is, I hope to show, a most important factor in the denudation of the earth's surface, especially in canyon production, by causing rapid undercutting where there are softer beds.

A hard surface layer covering softer rock will present conditions favourable to the formation of a waterfall. The water rushes over the hard ledge, and falls to the earth beneath. The swirl and the splash soon wear out a circular hole—a pot hole. If the ledge is of some height, the water leaps over. The spray is splashed around and the softer material under the ledge is worn out. Sooner or later, the surface ledge breaks off and falls in. Thus the canyon or gorge travels up stream.

This is the explanation usually given, and probably it is correct in most cases. However, at Coburg one day, when examining the head of some "bad lands" with canyons nearly 20 feet deep, this explanation was seen to be unsatisfactory for three reasons.

1. The quantity of water that was doing the wearing out was very small. It was only the small amount that flowed from a few square yards of a uniformly sloping hillside, for there was no stream, not even a gutter or runnel. It was too small a quantity to splash about.

2. This small amount of water could not have splashed high enough to wash the softer subsoil from just below the surface crust (a hard band several inches thick), which was at the height of eleven feet (Fig. 2).

3. There was no evidence of any fall of water at all. If a fall took place from that height, there would be a pot hole at the foot of the fall, or stones showing some signs of water splashing or falling. But there was no trace of this.

The usual explanation clearly did not account for the wearing out, and the evident recent advance up hill of this gorge. As no water was then running over, no other explanation presented itself at the time.

Shortly afterwards when at Heidelberg, the usual hollow was noticed under the surface crust; but it did not reach down to the bottom. The crust was six inches thick. Then a semicircular hollow about ten inches in diameter led to a gently sloping piece of about fifteen inches down to the bottom (Fig. 4.) Here, as no sign of any falling water could be seen on the sloping base, there was obviously no splash at all. Thus the water did not fall over. Close examination showed that the water trickled down the surface crust and then adhered underneath it, the water surface forming the outer wall of a kind of a pipe. The water then ran down, following under the surface crust, over the soft material underneath, and so trickled this down as liquid mud. Thus the earth was hollowed out right under the crust, but it had not yet been worn away down to the level of the bottom. Many little grooves could be plainly seen where the water had trickled down, and carried off the material.

A visit shortly after this to the Royal Park railway cutting showed where the water had trickled over the edge of a hard ironstone layer. It had carried down the sand and clay mixture under it. Some of this liquid mud had then fallen a short distance from a convenient hard point. Here it had built up two little mud pillars (stalagmites ?) of the deposits from the liquid mud which had trickled down.

In all the railway cuttings in the coastal plain material round Melbourne, this scooping out of the softer material under the harder bands can be clearly seen. That also is one of the features so noticeable in many of the good views of the Grand Canyon of the Colorado.

In each of the numerous cases of canyon formation now going on around Melbourne that I have visited, the same phenomena have been noticed. In a few cases, even where wearing away is proceeding very rapidly, no water falls over. All the water causing such serious loss to the land owners simply trickles down over the softer material. This, when wet, becomes liquid mud. So the solid earth is really melting or flowing away.

In one case at North Essendon a brick wall, with a large V opening for the water to flow in, was built across a gutter leading from a road to the adjacent Moonee Ponds Creek. This rejuvenated stream had deepened its bed over 20 feet. The trickle of water from the gutter soon wore the soft alluvium away, and formed a deep canyon.

The water then worked under the brick wall, which has now been left high and dry across a considerable canyon, with the water flowing many feet below the lower portion of the brickwork. This alarming result has been accomplished in a very short time by the very small quantity of water that flows, only after rain, in a gutter at the side of the road.

The harder Silurian bedrock, of course, would not be worn away so readily, so that it is only in the softer material of the coastal plain, or other recent deposits, that this very rapid weathering is going on. Still, it is being done by an insignificant quantity of water.

In the canyons at Coburg, the side of the gorge is coated with a very fine powdery material. This has been left there when the water, which in wet weather formed a film over it, evaporated. It is material which was in mechanical suspension, being carried down and acting in its turn as a file to wear away still more of the loosely cemented hill-side.

Even where there is water falling over into the canyon, some of it always trickles down adhering to the surface. It then quietly trickles out any softer band. Surface tension, therefore, greatly helps the splash in the wearing under by a waterfall.

In canyon formation, especially in the advance of the main canyon upstream and in the lateral widening of the canyon, surface tension is seen to be an agent of the first importance by enabling the water to adhere to the rock. This water thus runs over the softer bands, otherwise protected from water action. These are quickly worn out and removed. The harder beds being unsupported, now break off and fall in, and so the canyons grows. Thus the undercutting can in many cases be said to be directly due to the effect of the surface film of water.

A recent visit to the Coburg bad lands, east of Pentridge, showed many canyons, varying in depth up to nearly 20 feet. In not one single case could any trace be discovered of a splash at the bottom of the fall at the head of any of the several canyons.

As a teacher, difficulties have been experienced in leading a class to understand how on a slope, say N. and S., a lateral tributary might cut across this slope from E. to W., and the streams flowing on it be captured and diverted. There is some reason for believing some of the present rivers have so cut across the old southerly flowing rivers of Central Victoria.

To illustrate this an excursion was undertaken to Kilby Lagoon, near Kew. Here on the hillside is a canyon with several lateral tributaries. These carry but little water—just a trickle after rain in fact—yet the softer material has been quickly trickled down until now a lateral tributary, flowing entirely underground (for the surface crust, supported by the thick mat of grass roots, has not yet fallen in), drains much of that hillside, though it is sloping north, out to the west.

This wearing-out has been accomplished in a very short space of time, for the hillside has been ploughed, as the old furrows plainly show.

Thus surface tension, acting indirectly, is seen to be an agent in river capture by quietly but surely working a side tributary gorge back across other streams. The original streams are beheaded, and their waters diverted into the subsequent streams.

There has been a considerable boom in surface tension. It has been called in to explain, or at least to be held in some way responsible for, many divergent phenomena. The geologist, so far, has not claimed much from it, but here we can see it is proving a remarkably efficient aid in the rapid denudation of parts of the earth's surface.

In many parts of Victoria, even away from the coast, where there has been possibly a recent uplift to rejuvenate the streams, canyons are being formed. On the gold-fields the softer alluvial drifts also are being rapidly worn into canyons and bad lands.

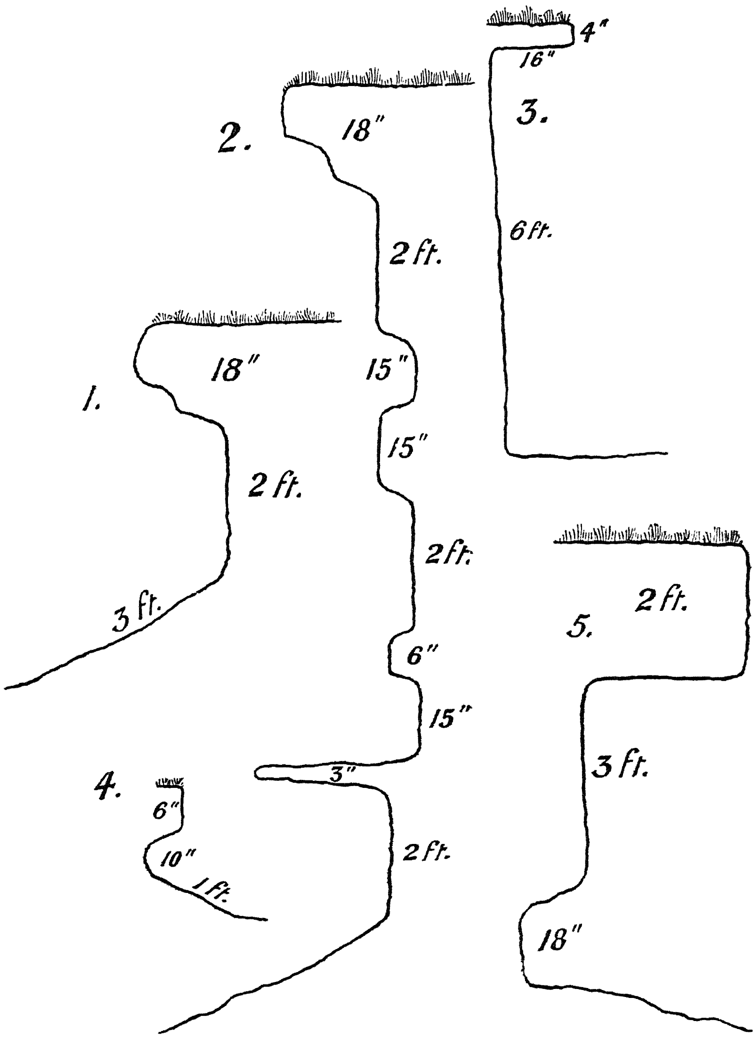
In conclusion, we have seen that in at least three ways surface tension is an important aid in denudation by enabling water to adhere to an undercut face.

1. Even where there is a waterfall, with its consequent splash, some water at least trickles down, adhering to the face throughout. By this means soft beds are trickled out. The harder bands, being unsupported, then break off.

2. Where there is not a permanent stream, surface tension is a most important agent (especially if there is only a small quantity of water), in assisting in the wearing-back of the head of a gorge. It is also of great importance in widening out a canyon and in the formation of tributary gorges and bad lands.

3. It is an important agent in river-capture by enabling a small quantity of water to attack the softer underlying layers, and so remove them. Thus it cuts back and across other streams.

It is to be distinctly understood that the general question of denudation and denuding agents is not discussed here. The point is the importance of the surface film as an agent in undercutting, as opposed to the splash from a waterfall. Thus the surface film becomes an aid in corrosion and erosion.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EXPLANATION OF PLATE XVII.

Fig 1. At Coburg, East of Pentridge. The surface crust is 18 inches thick, then comes softer material—a mixture of coarse sand and clay. There is no evidence of falling water or of splash.

Fig. 2. The head of a canyon at the same locality. The harder bands project. No water falls over.

Fig. 3. Also at Coburg. The surface crust is 4 inches thick.

Fig. 4. At Heidelberg. There is no evidence of a splash.

Fig. 5. At Coburg. The surface crust is 2 feet thick. There is a much softer band 18 inches wide near the bottom.

ANNUAL REPORT OF THE COUNCIL

FOR THE YEAR 1905.

The Council herewith presents to Members of the Society the Annual Report and Details of Receipts and Expenditure for the year 1905.

The following meetings were held:—

March 9.—Annual Meeting and Election of Officers. Ordinary Meeting. The following paper was read:—"A Palaeozoic Serpentine Conglomerate, North Gippsland," by A. E. Thiele. Exhibits: 1. Specimens in illustration of his paper, by A. E. Thiele. 2. Models of Foraminifera, by F. Chapman. 3. A series of pen and ink sketches, the property of the Society, being caricatures of the Herschell-Babbage Exploring Expedition in South Australia in 1858. They appear to be the work of a German. Dr. A. W. Howitt, who had examined the sketches, thought they must have originated about the year of the expedition, and have been drawn by someone familiar with the country and the members of the expedition, as the likenesses were recognisable.

April 13.—Paper read: "New or Little-known Fossils in the National Museum, Melbourne, Part 5. The Genus Receptaculites, with a note on R. Australis, from Mount Wyatt, Queensland," by F. Chapman. Exhibits: 1. Lialis burtonii, mimicking a young brown snake, Diemenia textilis (Furina bicucullata, McCoy). 2. Rabbit's skull, with very long upper incisors, by T. S. Hall. 3. Fresh water polyzoa (Plumatella), from Yan Yean water pipe, by J. Shephard.

May 5.—Professor W. Baldwin Spencer delivered a Lecture on "Totems and Totem Ceremonies Amongst the Central Australian Aborigines," illustrated by lantern slides.

June 8.—Paper read: "New or Little-known Fossils in the National Museum, Melbourne, Part 6. Some Devonian Spirifers," by F. Chapman. Professor W. C. Kernot exhibited a new steam gauge, and made remarks on the value of steam and gas engines.

July 13.—Papers: 1. "Victorian Graptolites, Part 3," from Mount Wellington. With descriptions of New Species, by T. S. Hall. "The Mineralogical Characters of Victorian Auriferous Occurrences," by T. S. Hart. Lecture: Professor A. W. Osborne lectured on "The Nervous System," illustrated by lantern views and blackboard drawings.

August 10.—Professor T. R. Lyle lectured on "The Conductivity of Gases and Radioactivity."

September 14.—Papers: 1. "The Sea Mills of Argostoli," by Professor W. C. Kernot. 2. "A Photographer in North-Western Tasmania," by J. H. Harvey (illustrated by numerous slides).

October 12.—Mr. E. J. Dunn lectured on "Centre Country and How to Find It." On the introduction of Professor Kernot, Mr. Finucane, who knew Argostoli, gave a description of the "Sea Mills."

November 16.—Mr. P. Baracchi lectured on "The Charting of the Heavens," illustrated by lantern slides.

December 14.—Papers: 1. Catalogue of the Marine Shells of Victoria, Part IX., by G. B. Pritchard and J. H. Gatliff. 2. "New or Little-known Fossils from the National Museum, Part 7. A New Cephalaspid from the Silurian of Wombat Creek," by F. Chapman. 3. "Some Geological Features of the Otway and Neighbouring Districts," illustrated by lantern slides, by T. S. Hall. Professor W. C. Kernot read a letter from the British Legation at Athens, referring to the Sea Mills of Argostoli and confirming the previous information given. By request, Professor E. W. Skeats described the "horn" of Mount Pele. The Printing and House Committees for the next year were appointed.

A series of lectures was inaugurated during the year, when five lectures, enumerated above, were delivered. The Council record its hearty thanks to the lecturers for their kindness in delivering them. The innovation was a great success, large audiences attended, and the interest of members in the Society was revived.

During the year six Members and ten Associates were elected. One Country Member and five Associates resigned, and the Society regrets the death of two Associates, Messrs. H. T. Tisdall and Hugh Bullen.

The Proceedings of the Society, New Series, Vol. XVII., Part 2, and Vol. XVIII., Part 1, were published during the year.

As in the previous year, a deputation of the Council waited on the Chief Secretary, to request an increase in the grant in aid of the publication of Scientific papers. The Council was, however, unable to secure any advance on the amount latterly received—viz., Fifty pounds. The number of papers published had consequently to be curtailed, and several valuable contributions had to be declined. As well as this, the preparation of papers by some members engaged in research was suspended. The loss of these publications and the check to investigation is greatly to be deplored. The Council will make a further appeal during the present year, and hopes that Members and Associates will do their utmost, by increasing our membership, to add to our resources. The Council also expresses a hope that the day is not far distant when those in our midst who can afford it will emulate the example shown in New South Wales and South Australia, by generously supporting work such as is undertaken by our Society.

A small amount has been expended in keeping the grounds and fencing in order, but more requires doing than we can afford.

The Hon. Librarian reports that 1629 volumes and parts were added to the Library during 1905—an increase of 517 over the previous year.

The more important additions were:—

University of Montana. Bulletin.
National Physical Laboratory. Reports.
Société Géologique du Nord. Annales.
Michigan Academy of Science.
Accademia dei Lincei. Large series.
Societa Geologica Italiana. V. 1-20.
Museum of Comparative Anatomy, Harvard.
Bureau of Science, Manila. Large series.
New York State Library.

No books were bound during the year

The Honorary Treasurer in Account with the Royal Society of Victoria.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from 1904	£84	14	1	By Printing and Stationery	£130	3	6
Government Grant	50	0	0	Postages, etc.	20	8	4
Subscriptions—				Freight, etc.	5	8	10
Members	59	17	0	Assistant-Secretary (13 months)	27	1	8
Country Members	17	7	0	Hall Keeper (13 months)	6	10	0
Associates	28	17	6	Rates	4	3	4
Arrears	17	17	0	Insurance	5	1	3
Rent of Rooms	8	0	0	Sewerage	2	9	10
Sale of Publications	6	0	0	Gas	3	13	0
				Collector's Commission	7	13	2
				Refreshments and Cleaning	5	10	10
				Periodicals	0	12	0
				Lantern	3	15	0
					£222	10	9
				Balance in Bank	50	1	10
	£272	12	7		£272	12	7

Compared with the Vouchers and Bank Pass-Book, and found correct,

(Signed) W. C. KERNOT,
Hon. Treasurer.

(Signed) H. MOORS,
P. DE JERSEY GRUT, } *Auditors.*

5th March, 1906.

Royal Society of Victoria.

1906.

Patron :

SIR REGINALD TALBOT, K.C.B.

President :

E. J. DUNN, F.G.S.

Vice-Presidents :

C. E. OLIVER, M.C.E.
P. BARACCHI, F.R.A.S.

Hon. Treasurer :

PROF. W. C. KERNOT, M.A., M.C.E.

Hon. Librarian :

R. D. BOYS, B.A.

Hon. Secretary :

T. S. HALL, M.A.

Council :

J. DENNANT, F.G.S., F.C.S.
P. DE J. GRUT.
DR. J. JAMIESON, M.D.
J. A. KERSHAW, F.E.S
PROF. T. R. LYLE, M.A.
J. SHEPHARD.
PROF. E. W. SKEATS, D.Sc.
PROF. W. BALDWIN SPENCER, C.M.G., M.A., F.R.S.
G. SWEET, F.G.S.
R. H. WALCOTT, F.G.S.
E. J. WHITE, F.R.A.S.
F. WISEWOULD.

Committees of the Council:

House Committee:

THE HON. TREASURER (CONVENER).
P. DE J. GRUT.
G. SWEET, F.G.S.

Printing Committee:

THE PRESIDENT.
THE HON. TREASURER.
THE HON. SECRETARY (CONVENER).
PROF. W. BALDWIN SPENCER, C.M.G., M.A., F.R.S.

Honorary Auditors:

H. MOORS.
J. E. GILBERT.

Honorary Architect:

W. A. M. BLACKETT.

1906.

LIST OF MEMBERS,

WITH THEIR YEAR OF JOINING.

Patron.

His Excellency Sir Reginald Talbot, K.C.B.	1904

Honorary Members.

Forrest, The Hon. Sir J., K.C.M.G., West Australia ...	1888
Hector, Sir James, K.C.M.G., M.D., F.R.S., Wellington, N.Z.	1888
Liversidge, Professor A., LL.D., F.R.S., University, Sydney, N.S.W.	1892
Neumayer, Prof. George, Ph.D., F.R.S., Neustadt a.d. Haardt, Germany	1857
Russell, H. C., B.A., F.R.S., F.R.A.S., Observatory, Sydney, N.S.W.	1888
Scott, Rev. W., M.A., Kurrajong Heights, N.S.W.	1855
Todd, Sir Charles, K.C.M.G., F.R.S., Adelaide, S.A.	1856
Verbeek, Dr. R. D. M., Buitenzorg, Batavia, Java	1886

Life Members.

Butters, J. S., F.R.G.S., Empire Buildings, Collins-street west	1860
Eaton, H. F.	1857
Fowler, Thos. W., M.C.E., Colonial Mutual Ch., 421 Collins-street, Melbourne	1879

Gibbons, Sydney, F.C.S., 31 Gipps-street, East Melbourne.	1854
Gilbert, J. E., "Melrose," Glenferrie-road, Kew	1872
Love, E. F. J., M.A., F.R.A.S., 213 Victoria Terrace, Royal Park	1888
Nicholas, William, F.G.S.	1864
Rusden, H. K., Glenhuntly-road, Elsternwick	1866
Selby, G. W., 99 Queen-street, Melbourne	1881
White, E. J., F.R.A.S., Observatory, Melbourne	1868

ORDINARY MEMBERS.

Balfour, Lewis, B.A., M.B., B.S., Burwood-road, Hawthorn	1892
Baracchi, Pietro, F.R.A.S., Observatory, Melbourne	1887
Barnes, Benjamin, Queen's Terrace, South Melbourne	1866
Bavay, A. F. J. de, Foster Brewery, Collingwood	1905
Boese, C. H. E., 159 Hoddle-street, Richmond	1895
Boys, R. D., B.A., Public Library, Melbourne	1903
Cherry, T., M.D., M.S., Department of Agriculture, Melbourne	1893
Cohen, Joseph B., A.R.I.B.A., Public Works Department, Melbourne	1877
Chapman, F., A.L.S., National Museum, Melbourne	1902
Dennant, John, F.G.S., F.C.S., Stanhope-grove, Camberwell	1886
Dunn, E. J., F.G.S., "Roseneath," Pakington-street, Kew	1893
Ellery, R. L. J., C.M.G., F.R.S., F.R.A.S., Observatory, Melbourne	1856
Ewart, Prof. A. J., D.Sc., F.L.S., University, Melbourne	1906
Field, W. E., 65 Sutherland-road, Armadale	1903
Fox, Dr. W. R., L.R.C.S., L.R.C.P., "York House," Brunswick-street, North Fitzroy	1899
Fryett, A. G., care Dr. F. Bird, Spring-street, Melbourne	1900
Gault, Dr. E. L., M.A., M.B., B.S., Collins-street, Melbourne	1899
Gillott, The Hon. Sir S., K.C.M.G., M.L.A., "Edensor," Brunswick-street, Fitzroy	1905
Grut, P. de Jersey, 125 Osborne-street, South Yarra	1901

Hake, C. N., F.C.S., Melbourne Club, Melbourne	1890
Hall, T. S., M.A., University, Melbourne	1890
Hartnell, W. A., "Irrewarra," Burke-road Camberwell	1900
Harvey, J. H., A.R.V.I.A., 128 Powlett-street, East Melbourne	1895
Heffernan, E. B., M.D., B.S., 10 Brunswick-street, Fitzroy	1879
Hogg, E. G., M.A.	1890
Hooper, Dr. J. W. Dunbar, L.R.C.S., etc., Collins-street, Melbourne	1904
Howat, Wm., 458 William-street, Melbourne	1903
Jamieson, James, M.D., 96 Exhibition-street, Melbourne	1877
Jenkins, H. C., A.R.S.M.	1899
Kernot, Professor W. C., M.A., M.C.E., University, Melbourne	1870
Kernot, W. N., B.C.E., Working Men's College, Melbourne	1906
Kershaw, J. A., F.E.S., National Museum, Swanston-street	1900
Kitson, A. E., F.G.S., Department of Mines, Melbourne	1894
Lyle, Prof. T. R., M.A., University, Melbourne	1889
Loughrey, B., M.A., M.D., Ch.B., M.C.E., 1 Elgin-street, Hawthorn	1880
Masson, Prof. Orme, M.A., D.Sc., University, Melbourne	1887
Michell, J. H., M.A., F.R.S., University, Melbourne	1900
Moors, H., 498 Punt-road, South Yarra	1875
Muntz, T. B., C.E., Wattletree-road, Malvern	1873
Mills, A. L., University, Melbourne	1903
Nanson, Prof. E. T., M.A., University, Melbourne	1875
Oliver, C. E., M.C.E., Metropolitan Board of Works, Melbourne.	1878
Schlapp, H. H., 31 Queen-street, Melbourne	1906
Shephard, John, 268 City-road, South Melbourne	1894
Skeats, Prof. E. W., D.Sc., University, Melbourne	1905
Spencer, Prof. W. Baldwin, C.M.G., M.A., F.R.S., University, Melbourne	1887
Sugden, Rev. E. H., M.A., B.Sc., Queen's College, Carlton	1899
Sweet, George, F.G.S., Wilson-street, Brunswick	1887
Swinburne, The Hon. G., M.L.A., "Shenton," Kinkora-road, Hawthorn	1905
Tait, Thos., "Orwell," Robe-street, St. Kilda	1905

Walcott, R. H., F.G.S., Technological Museum, Swanston-street	1897
Ware, S., M.A., Education Department, Melbourne	1901
Wilkinson, W. Percy, Govt. Analyst, Melbourne	1894
Wisewould, F., 408 Collins-street, Melbourne	1902

COUNTRY MEMBERS.

Brittlebank, C. C., "Dunbar," Myrniong, Victoria	1898
Desmond, J., R.V.S., G.M.V.C., Central Board of Health, Adelaide, S.A.	1901
Gregory, Prof. J. W., D.Sc., F.R.S., University, Glasgow	1900
Hart, T. S., M.A., B.C.E., School of Mines, Ballarat	1894
Heden, E. C. B., B.A., B.Sc., B.E.	1904
Hill, W. H. F., "Glenrowan," Dandenong-road, Windsor	1894
Hogg, H. R., M.A., 2 Vicarage Gate, Kensington, W.	1890
Howitt, A. W., F.G.S., D.Sc., "Clovelly," Metung	1877
Ingram, Alex., Hamilton, Victoria	1903
Maplestone, C. M., Eltham, Victoria	1898
Martell, F. J., School of Mines, Ballarat	1897
McDougall, Duncan, Maryborough, Victoria	1897
Mennell, F. P., Rhodesian Museum, Buluwayo, South Africa	1902
Murray, Stuart, C.E., "Morningside," Kyneton	1874
Oddie, James, Dana-street, Ballarat, Victoria	1882
Officer, C. G. W., B.Sc., "Kallara," Bourke, N.S.W.	1890
Powell, Walter D. T., Cape Moreton Lighthouse, Brisbane, Queensland	1886
Tipping, Isaac, C.E., Castlemaine, Victoria	1892

CORRESPONDING MEMBERS.

Bailey, F. M., F.L.S., Government Botanist, Brisbane, Queensland	1880
Dendy, Professor Arthur, D.Sc., F.L.S., King's College, London	1888

Etheridge, Robert, Junr., Australian Museum, Sydney, N.S.W.	1877
Lucas, A. H. S., M.A., B.Sc., Sydney Grammar School, Sydney, N.S.W.	1895
Stirton, James, M.D., F.L.S., 15 Newton-street, Glasgow	1880

ASSOCIATES.

Anderson, J., 225 Beaconsfield Parade, Middle Park	1903
Bage, Mrs. Edward, Fulton-street, St. Kilda	1906
Bage, Miss F., B.Sc., Fulton-street, St. Kilda	1906
Baker, Thomas, Bond-street, Abbotsford, Victoria	1889
Bale, W. M., F.R.M.S., Walpole-street, Hyde Park, Kew, Victoria	1887
Bennetts, W. R., 184 Brunswick-street, Fitzroy, Victoria	1894
Boyd, R. M., "Glynderbourne," Boundary-road, Toorak	1906
Booth, John, M.C.E., 62 Drummond-street, Carlton	1872
Bolton, G. J., M.A., 87 Mt. Alexander-road, Flemington	1904
Brown, A. A., 124 Liardet-street, Port Melbourne	1902
Brook, R. H. T., Tongio West, N. Gippsland	1906
Cresswell, Rev. A. W., M.A., St. John's Parsonage, Camberwell, Victoria	1887
Clendinnen, Dr. F. J., Williams-road, Toorak	1906
Danks, A. T., 391 Bourke-street West, Melbourne	1883
Ferguson, W. H., "Maryland Villa," Camberwell-road, Camberwell	1894
Finney, W. H., 40 Merton-street, Albert Park	1881
Fison, Rev. Lorimer, M.A., D.D., Essendon, Victoria	1889
Fulton, S. W., 369 Collins-street, Melbourne	1900
Gabriel, J., Victoria-street, Abbotsford, Victoria	1887
Gatliff, J. H., Commercial Bank of Australasia, Lygon-street, Carlton	1898
Grant, Kerr, M.Sc., Ormond College, Parkville	1905
Green, W. Heber, D.Sc., University, Melbourne	1896
Grayson, H. J., University, Melbourne	1902
Hall, Robt., F.L.S., C.M.Z.S., Elgar-road, Box Hill	1900
Hardy, A. D., F.R.M.S., Lands Department, Melbourne	1903
Henderson, A. A., B.Sc., Department of Mines, Melbourne	1905

Herman, Hyman, B.C.E., F.G.S., Waratah, Tasmania	1897
Holmes, W. A., Telegraph Engineer's Office, Railway Department, Melbourne	1879

Ingamells, F. N., Observatory, Melbourne	1889

Jobbins, G. G., Electric Lighting and Traction Co., Geelong	1902
Jutson, J. T., "Oakworth," Smith-street, Northcote	1902

Kenyon, A. S., Heidelberg	1901
Kernot, Frederick A., 57 Russell-street, Melbourne	1881

Lambert, Thomas, Bank of New South Wales, Collins-street, Melbourne	1890
Larking, R. J., "Woorigoleen," Clendon-road, Toorak	1905
Law, R., F.I.C., F.C.S., Royal Mint, Melbourne	1905
Le Souef, D., C.M.Z.S., Royal Park, Melbourne	1894
Lidgey, E. A.	1894
Luly, W. H., Department of Lands, Treasury, Melbourne	1896
Leach, J. A., M.Sc., Continuation School, Melbourne	1904
Lowe, Dr. W.	1905

Maclean, C. W., "Bronte," Strand, Williamstown	1879
Mahony, D. J., B.Sc., Department of Mines, Melbourne	1901
Mattingley, A. H. E., 6 Alfred-street, N. Melbourne	1903
Mathew, Rev. John, M.A., B.D., Coburg	1890
McEwan, John, 371 Collins-street	1898
Melville, A. G., Mullen's Library, Collins-street East, Melbourne	1889

Nicholls, E. B., 164a Victoria-street, N. Melbourne	1904

Odling, F. J., C.E., Metallurgical Laboratory, Princes Bridge, Melbourne	1905
O'Neill, W. J., Lands Department, Melbourne	1903

Phillips, A. E., Box 396, G.P.O., Melbourne	1883
Pritchard, G. B., F.G.S., Mantell-street, Moonee Ponds	1892

Sayce, O. A., Harcourt-street, Hawthorn	1898
Schafer, R., "Invercloy," Napier-street, Essendon	1883
Shaw, Alfred C., Bond-street, Abbotsford, Victoria	1896
Smith, F. Voss	1901
Smith, G. P., "Earlscourt," Glenferrie-road, Hawthorn	1901
Smith, J. A., 15 Collins-place, Melbourne	1905

Stephen, Rev. R., M.A., Holy Trinity Vicarage, Dickens-street, St. Kilda	1901
Stewart, C., M.C.E., Shire Hall, Preston	1883
Summers, H., B.Sc., 67 Leopold-street, S. Yarra	1902
Sutherland, Iam M., "Novar," Dandenong	1905
Sutton, E. H., Survey Branch, Titles Office, Melbourne ...	1902
Sweet, Miss G., D.Sc., Wilson-street, Brunswick	1906

Thiele, E. O., "Heimruh," Finlayson-street, Malvern ...	1898
Traill, J. C., B.A., B.C.E., "Osmington," Domain-road, South Yarra	1903

Wedeles, James, 231 Flinders-lane, Melbourne	1896
Woodward, J. H., Queen's Buildings, Rathdowne-street, Carlton	1903

LIST OF THE INSTITUTIONS AND LEARNED SOCIETIES THAT RECEIVE COPIES OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE ROYAL SOCIETY OF VICTORIA.

1906.

Argentina.

Academía Nacional de Ciencias Exactas … … … …	Cordoba
Facultad de Ciencias Fisico-matematicas.	Universidad de La Plata
Museo de La Plata … … … … … … … … …	Buenos Ayres

Australian Commonwealth.

Federal Parliamentary Library … … … … … …	Melbourne

Austro-Hungary.

K. Akademie der Wissenchaften … … … … … … …	Vienna
K. K. Geographische Gessellschaft … … … … … …	Vienna
K. K. Geologische Reichsanstalt … … … … … … …	Vienna
K. K. Gradmessungs-Bureau … … … … … … … …	Vienna
K. K. Naturhistorisches Hofmuseum … … … … … …	Vienna
K. K. Sternwarte … … … … … … … … … … … …	Prague

Belgium.

Académie Royale des Sciences de Belgique … … …	Bruxelles
Société Belge de Geologie … … … … … … … …	Bruxelles
Société Géologique de Belgique … … … … … … …	Liége
Société Royale de Botanique de Belgique … … …	Bruxelles
Société Royale Malacologique de Belgique … … …	Bruxelles

Brazil.

Museu Paulista … … … … … … … … … … … …	S. Paulo
Sociedade Scientifica … … … … … … … … … …	S. Paulo

Canada.

Canadian Institute … … … … … … … … … … …	Toronto
Department of Interior … … … … … … … … …	Ottawa
Geological and Natural History Survey of Canada …	Ottawa

Legislative Library	Victoria, B.C.
Natural History Society of Montreal	Montreal
Nova Scotian Institute of Science	Halifax
Ottawa Literary and Scientific Society	Ottawa
Parliamentary Library	Ottawa
Royal Society of Canada	Montreal

CAPE COLONY.

Albany Museum	Grahamstown
Geological Commission	Capetown
South African Museum	Capetown
S. African Assoc. for the Advancement of Science	Capetown
South African Philosophical Society	Capetown

DENMARK.

Kon. Danske Videnskabernes Selskab	Copenhagen

ENGLAND.

Agent-General of Victoria	London
Anthropological Institute	London
Balfour Library	Cambridge
Bodleian Library	Oxford
Bristol Naturalists' Society	Bristol
British Museum	London
British Museum (Natural History)	London
Colonial Office Library	London
Conchological Society of Great Britain and Ireland	Manchester
Foreign Office Library	London
Free Public Library	Liverpool
Geological Society	London
Geologists' Association	London
Institute of Mining and Mechanical Engineers	Newcastle
Linnæan Society	London
Literary and Philosophical Society	Manchester
Liverpool Biological Society	Liverpool
Liverpool Literary and Philosophical Society	Liverpool
Manchester Museum, Owens College	Manchester
Marine Biological Laboratory	Plymouth
National Physical Laboratory	Teddington, Middlesex
"Nature"	London
Owens College Library	Manchester
Patent Office, 25 Southampton Buildings	London
Philosophical Society	Cambridge
Physical Society	London
Radcliffe Library	Oxford

Royal College of Science	South Kensington
Royal Colonial Institute	London
Royal Botanic Gardens	Kew
Royal Geographical Society	London
Royal Microscopical Society	London
Royal Society	London
"Science Abstracts"	London
University College	London
University Library	Cambridge
University of Leeds	Leeds
Zoological Society	London

FRANCE.

Académie des Sciences, Belles Lettres et Arts	Lyon
Faculté des Sciences	Marseilles
Feuille des Jeunes Naturalistes	Paris
Observatoire Météorologique du Mont Blanc	Paris
Société des Sciences Naturelles de l'Ouest de la France (Museum)	Nantes
Société Geologique du Nord	Lille
Société Nationale de Cherbourg	Cherbourg
Société Zoologique de France	Paris
Station Zoologique de Cette	Cette (Hérault)
Universite de Rennes	Rennes

GERMANY.

Deutsche Geologische Gesellshaft	Berlin
Gesellschaft fur Erdkunde	Berlin
Jenaische Zeitsch. f. Medicin und Naturwissenschaft	Jena
Königl.-bäyer., Akademie der Wissenchaften	Munich
Königl. Biologische Anstalt	Helgoland
Kön. Zoologisches Museum	Berlin
Königl. Offentl. Bibliothek	Dresden
Königl. Preussische Akademie der Wissenschaften	Berlin
Königl. Sächs. Gesellschaft der Wissenschaften	Leipzig
Königl. Gesellschaft der Wissenschaften	Göttingen
Museum für Natur-und Heimatkunde	Magdeburg
Naturforschende Gesellschaft	Emden
Naturforschende Gesellschaft	Freiburg i. Breisgau
Naturforschende Gesellschaft	Leipzig
Naturhistorisch-Medicinischer Verein	Heidelberg
Naturhistorische Gesellschaft	Nürnberg
Naturhistorisches Museum	Hamburg
Naturwissenschaftlicher Verein	Frankfurt a. d. Oder
Naturwissenschaftlicher Verein	Bremen

Oberhessische Gesellschaft für Natur u. Heilkunde	Giessen
Physikalisch-medicinische Gesellschaft	Wurzburg
Schlesische Gesellschaft für vaterländische Cultur	Breslau
Senckenbergische Naturforschende Gesellschaft	Frankfurt am M.
Verein für Erdkunde	Darmstadt
Verein für Erdkunde	Halle
Verein für Naturkunde	Kassel

HAWAIIAN ISLANDS.

Bernice Pauahai Bishop Museum	Honolulu

HOLLAND.

Musée Teyler	Haarlem
Natuurkundig Genootschap	Groningen
Nederlandsche Botanische Vereeniging	Nijmegen
Kon. Akademie van Wetenschappen	Amsterdam
Rijks Geologisch-Mineralogisch Museum	Leyden
Société Hollandaise des Sciences	Haarlem
Société Provinciale des Arts et Sciences	Utrecht

INDIA.

Asiatic Society of Bengal	Calcutta
Geological Survey of India	Calcutta
Indian Museum	Calcutta
Madras Literary Society	Madras
Royal Asiatic Society, Ceylon Branch	Colombo

IRELAND.

Belfast Natural History and Philisophical Society	Belfast
Royal Dublin Society	Dublin
Royal Irish Academy	Dublin
Trinity College Library	Dublin

ITALY.

Biblioteca Nazionale Vittorio Emanuele	Rome
Istituto Zoologico, R. Università	Naples
Musei di Zoologia ed Anatomia Comp., R. Università	Turin
Ministero dei Lavori Pubblici	Rome
Reale Accademia dei Lincei	Rome
R. Accademia delle Scienze dell' Istituto	Bologna
Reale Accademia di Scienze	Palermo
Reale Accademia di Scienze, Lettere ed Arti	Lucca
Regia Accademia di Scienze, Lettere ed Arti	Modena

Società Geologica Italiana	Rome
Società Geografica Italiana	Rome
Società Toscana di Scienze Naturali	Pisa
Zoological Station	Naples

JAPAN.

Imperial University	Tokio
Kyōto Imperial University	Kyōto

JAVA.

Bataviaasch Genootschap van Kunsten en Wetenschappen	Batavia
Magnetical and Meteorological Observatory	Batavia

MAURITIUS.

Royal Alfred Observatory	Mauritius

MEXICO.

Instituto Geologico de Mexico	Mexico
Ministerio de Fomento	Mexico
Observatorio Meteorologico Magnetico Central	Mexico
Observatorio Astronomico Nacional	Tacubaya
Sociedad Científica "Antonio Alzate"	Mexico

NATAL.

Government Museum	Pietermaritzburg

NEW SOUTH WALES.

Australian Museum	Sydney
Astronomical Observatory	Sydney
Botanic Gardens	Sydney
Department of Agriculture	Sydney
Department of Mines	Sydney
Linnæan Society of New South Wales	Sydney
New South Wales Naturalists' Club	Sydney
Parliamentary Library	Sydney
Public Library	Sydney
Royal Anthropological Society of Australasia	Sydney
Royal Society	Sydney
Sydney University Engineering Society	Sydney
Technological Museum	Sydney
University Library	Sydney

NEW ZEALAND.

Auckland Institute and Museum	Auckland
Colonial Museum	Wellington
Geological Survey	Wellington
Museum	Christchurch
New Zealand Institute	Wellington
Otago Institute	Dunedin
Parliamentary Library	Wellington
Public Library	Wellington

NORWAY.

Archiv for Mathematik og Naturvidenskab	Christiania
Bergens Museum	Bergen
Kon. Norsk Fredricks Universitet	Christiania
Nyt Magazin for Naturvidenskaberne	Christiania
Videnskabs-Selskabet	Christiania

PERU.

Cuerpo de Ingenieros de Minas del Peru	Lima

PHILIPPINE ISLANDS.

Bureau of Science (Department of Interior)	Manila

PORTUGAL.

Sociedade de Geographia	Lisbon

QUEENSLAND.

Geological Survey Office	Brisbane
Paliamentary Library	Brisbane
Public Library and Museum	Brisbane
Royal Geographical Society	Brisbane
Royal Society of Queensland	Brisbane

RHODESIA.

Rhodesia Museum	Buluwayo

ROUMANIA.

Institut Météorologique de Roumanie	Bucharest

RUSSIA.

Académie Impériale des Sciences	St. Petersburg
Comité Géologique de Russie	St. Petersburg
Commission Géologique de Finlande	Helsingfors

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